United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Iowa Agriculture and Home Economics Experiment Station; Cooperative Extension Service, Iowa State University; and Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship

Soil Survey of Scott County, Iowa

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How To Use This Soil Survey

General Soil Map

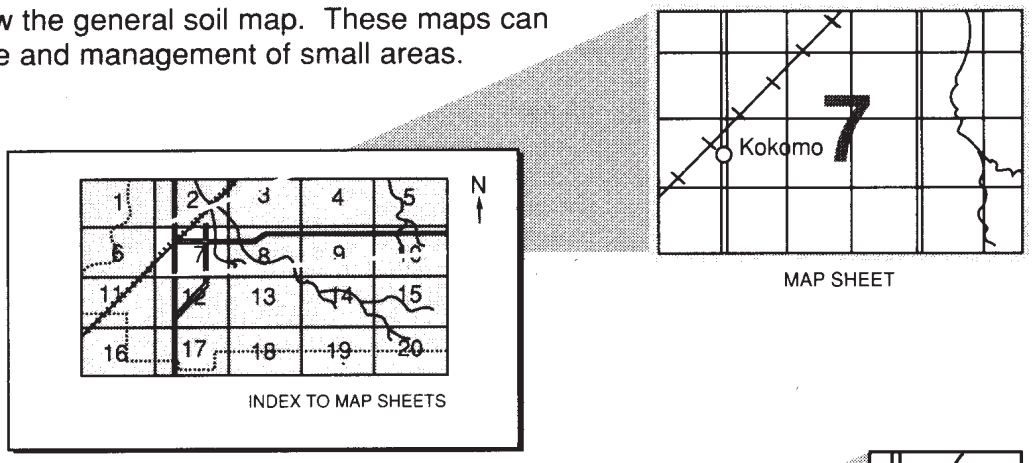
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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

Detailed Soil Maps

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

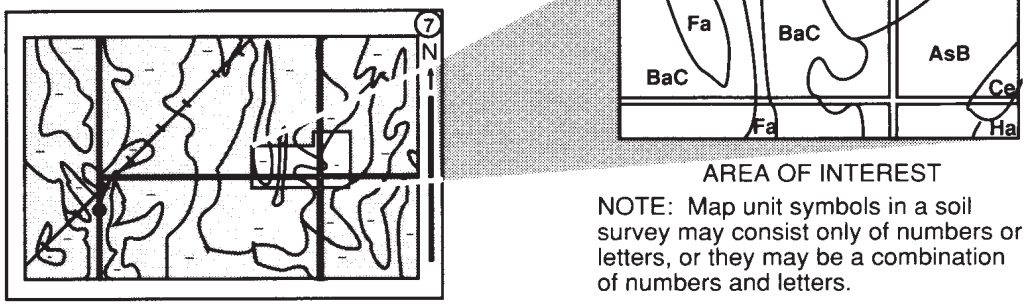
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

MAP SHEET

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



MAP SHEET

AREA OF INTEREST

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

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

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The 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 1987. Soil names and descriptions were approved in 1989. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1987. This survey was made cooperatively by the Natural Resources Conservation Service; the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship. It is part of the technical assistance furnished to the Scott County Soil and Water Conservation District. Funds appropriated by Scott County were used to defray part of the cost of the survey.

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: Soybeans in an area of the Muscatine-Tama-Garwin association in Scott County.

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Issued September 1996

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Summary of Tables

Preface

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

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

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

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

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Soil Survey of Scott County, Iowa

By Melvin D. Brown, Natural Resources Conservation Service

Fieldwork by Thomas E. Brantmeier, Melvin D. Brown, and Paul P. Viner, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship

SCOTT COUNTY is in east-central Iowa (fig. 1). It is bounded on the east and south by the Mississippi River and on the north by the Wapsipinicon River. In 1980, the county had a population of 160,022. Davenport, the county seat, had a population of 103,264, or more than 64 percent of the total population in the county. During the period 1970-80, the population of the county increased by 12 percent. This increase accounted for 66 percent of the increase in the population of Iowa during that period. The net increase in the population of the state during the period was 83,400. Of this increase, 1 out of every 20 new residents moved to rural areas of the county.

Scott County has an area of 299,900 acres. About 78 percent of the county is agricultural land, about 18 percent is urban land, and about 4 percent is wetland, woodland, or miscellaneous areas.

Three major kinds of landscape are in the county. The landscape along the southern and eastern edges and the northwest corner is characterized by a well defined surface drainage system. It has outcroppings of bedrock, steep side slopes, and flat, relatively narrow foot slopes and bottom land that extend to the river. The soils in these areas mainly formed under forest vegetation. The landscape along the northern edge of the county is similar to that along the southern and eastern edges, but it is not so steep and has a wide river terrace. The landscape in the central and western parts of the county is characterized by glacial till plains that are covered with loess. The soils in these areas mainly formed under prairie vegetation. The nearly level and gently sloping soils on the bottom land and terraces along the Mississippi and Wapsipinicon Rivers formed in alluvium.

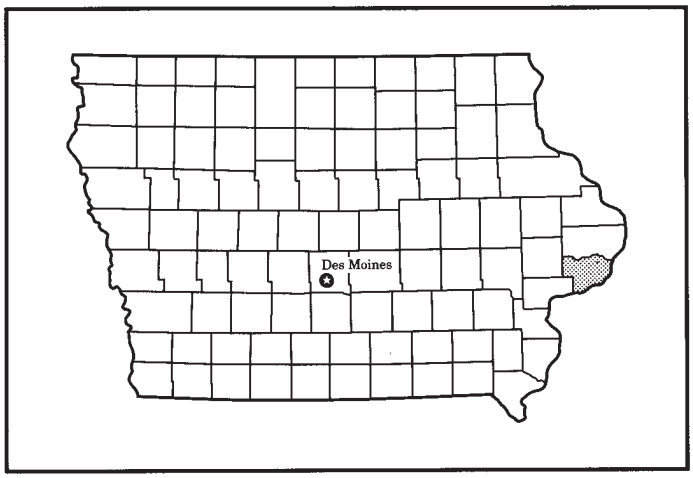

Figure 1.—Location of Scott County in Iowa.

This survey updates the soil survey of Scott County published in 1915 *(9)*. It provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

This section provides information about climate; physiography, relief, and drainage; history and development; farming; and transportation facilities. The climate and the soils in the county have affected the pattern of agricultural, industrial, and cultural development.

Climate

Scott County is cold in winter and is quite hot with occasional cool spells in summer. Precipitation during the winter frequently occurs as snowstorms. During the warm months, it is mainly showers, which are often heavy and occur when warm, moist air moves in from the south. The total annual rainfall is normally adequate for corn, soybeans, and small grain.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Davenport, Iowa, in the period 1951 to 1984. 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 25 degrees F and the average daily minimum temperature is 17 degrees. The lowest temperature on record, which occurred at Davenport on January 10, 1982, is -22 degrees. In summer, the average temperature is 74 degrees and the average daily maximum temperature is 83 degrees. The highest recorded temperature, which occurred at Davenport on July 28, 1983, is 100 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 34 inches. Of this, about 23 inches, or 65 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 19 inches. The heaviest 1-day rainfall during the period of record was 5.2 inches at Davenport on July 19, 1963. Thunderstorms occur on about 47 days each year.

The average seasonal snowfall is about 28 inches. The greatest snow depth at any one time during the period of record was 30 inches. On the average, 33 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 65 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the west-northwest. Average windspeed is highest, 12 miles per hour, in spring.

Tornadoes and severe thunderstorms occur occasionally. These storms are local in extent and of short duration. They result in sparse damage in narrow belts. Hailstorms occur at times during the warmer part of the year in irregular patterns and in relatively small areas.

Physiography, Relief, and Drainage

Scott County is on the west bank of the Mississippi River. Slopes in the county generally are gently rolling to hilly or steep. Some small areas of alluvial bottom land are along the Mississippi and Wapsipinicon Rivers, and a river terrace is along the Wapsipinicon River. The topography of the uplands along the Mississippi River is steep and very steep. The uplands have some outcroppings of bedrock. The percentage of slope decreases as the distance from the river increases.

About half of the county drains directly into the Mississippi River, and the other half drains into the Wapsipinicon River, which empties into the Mississippi River in the northeast corner of the county. The flood plain along the rivers is level to gently sloping, although it is dissected by stream channels in places.

History and Development

The original inhabitants in the area were Native Americans from various Indian nations. The last and the best known of the tribes were the Sauk and Fox. In 1804, the U.S. Government and some of the Indian leaders signed a treaty whereby the Indians were to give up their land to European settlers and relocate to land less desired by the settlers. The treaty was never accepted by Chief Black Hawk, a leader of the Sauk Nation. In 1832, a dispute over some of the land caused the Black Hawk War and resulted in the defeat of Chief Black Hawk. With the ratification of the treaty of 1833 by the U.S. Congress, the land formerly owned by the Indians became part of the United States.

The first Europeans in the area were the French explorers Jacques Marquette and Louis Joliet. They explored the area in 1673. Captain Benjaman W. Clark was the first settler in Scott County. During the winter of 1833-34, he moved to the present site of the town of Buffalo from what is now Andalusia, Illinois. By 1837, the population of settlers had increased enough so that

the people of the area were entitled to county organization. Scott County was established during the winter of 1837-38 by the legislature of the Wisconsin Territory of which Scott County was a part. It was named for General Winfield Scott, who was prominent in the Black Hawk War and the war with Mexico. In 1840, Davenport was named as the county seat.

The population has grown rapidly over the years to where Scott County is now the third largest population center in Iowa. The city of Eldridge, which is in the center of the county and has a population of 3,279, was one of the fastest growing cities in Iowa in the early 1980's. Bettendorf, which is along the Mississippi River, held that title for many years earlier.

The Mississippi River has had the most influence on the development of Scott County than any other single element. Outcroppings of limestone bedrock in the riverbed extend from where the river starts its westward flow almost to where it heads south again. They not only form the fortress island of Rock Island but also a series of treacherous rapids that forced river travelers and transporters to take more complicated measures of getting downriver. As a result, river-related businesses and economic interests of the area were started and settlement of the area began.

The river also provided inexpensive water power. Many people moved to the area to work in mills that were powered by water from the river. In 1910, commercial enterprises in the county included lumber and flour mills and a corn products refining company, which made about 20,000 bushels of sugar a day out of corn and employed more than 500 people. Factories in the county included three that manufactured washing machines, one that manufactured cans, and the country's largest broom factory, as well as many other shops and factories. The river provided a naturally protected island for an arsenal for the U.S. Department of the Army, which has become one of the major employers in the area. In 1910, Davenport was the second richest city in the United States on a per capita basis. The river also provided transportation and easy access to other centers in the United States. It was also a very important source of water to put out fires.

Although agriculture makes up only 0.8 percent of the economic and cultural activity in the county and had no direct influence on the development of the area, the agricultural interests in the county and surrounding area have brought other agricultural manufacturers to Davenport, as well as to neighboring communities in Illinois.

After the Civil War, the indigenous resources of coal were abundant and accessible enough to spur many new industries to develop. The economic development of all the settlements along the river were so intertwined that they all had part in helping each other grow with the rapid economic growth of the area. Davenport, which became a major banking center, had the first national bank in the Nation.

The thriving, enterprising, and ambitious urban and rural populace has steadily developed the Davenport area into a very productive area of the country. This steady growth and development of the county makes the need for proper land use greater every year.

Farming

Scott County has been one of the most agriculturally productive counties in the state for more than 50 years. It also has some of the highest priced land in the state. Though the county is one of the most agriculturally productive in the state, the urban-industrial sector of the population is so large and so productive that the agricultural sector is minor compared to the county's total economy. In 1856, about 50 percent of the residents worked the land; by 1950, that figure had dropped to 15 percent; and by 1980, it was 2 percent. In 1920, about 92 percent of the county was farmland and most of the farms were diversified in nature. In 1983, only 75 percent of the county was farmland and most of the farms were grain farms. Though there are still many farms that have livestock, most farms depend on grain production for income. Corn and soybeans are the main row crops.

In 1980, the county had 1,040 farms, which averaged about 232 acres in size. In the 1960's and 1970's, the number of farms decreased while the average size of the farms increased. The average age of the farm operator also decreased. In recent years, the number of farms has decreased, but the average size of the farms is nearly the same or only slightly less. Since 1940, the population of the county has increased by about 20,000 each 10 years. As a result, the acreage of agricultural land converted for residential or commercial uses has increased. From 1962 to 1982, more than 10,000 acres of agricultural land was converted for urban uses. Recently, the acreage converted for urban uses has been confined to land within the existing city limits. Only 50 acres or less is converted annually to nonfarm uses in the rural part of the county.

Transportation Facilities

Five U.S. highways, including two interstate highways, and two State highways serve the county. U.S. Highways 67 and 61 run predominantly north and south, and U.S. Highway 6 and Interstate 80 run predominantly east and west. State Highway 130 runs northwest to southeast, and State Highway 22 follows along the Mississippi River and ends in Davenport.

Hard surfaced roads connect these highways to nearly all of the smaller communities in the county. Roads of crushed limestone or gravel are near most farmsteads.

Two major railroad lines serve the county. Davenport has bus service and an airport. Motor freight lines serve every trading center in the county.

River barges carry grain from several river terminals on the Mississippi River to world trade centers down the river. Petroleum products, crushed stone, and cement products also are exported on barges from more than 15 river terminals in the county. Scott County is among the six counties in the State shipping the highest tonnage of commodities by rail and barge.

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 *(11)*.

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

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

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

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

Map Unit Composition

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

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

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

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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. Tama Association

Gently sloping to moderately steep, well drained soils formed in loess; on uplands

This association consists of gently sloping to moderately sloping soils on ridgetops and moderately sloping to moderately steep soils on side slopes.

This association makes up about 48 percent of the county. It is about 51 percent Tama and similar soils and 49 percent soils of minor extent (fig. 2).

The Tama soils are well drained. They are gently sloping to moderately steep on ridgetops and side slopes.

Typically, the surface layer of the Tama soils is very dark brown, friable silty clay loam about 8 inches thick. The subsurface layer is very dark brown and very dark grayish brown, friable silty clay loam about 11 inches thick. The subsoil to a depth of about 60 inches is friable silty clay loam. The upper part is brown, and the lower part is mottled brown and yellowish brown.

The minor soils in this association are the Dickinson, Dinsdale, Downs, Exette, Garwin, Kenyon, Muscatine, and Timula soils in the uplands and the Colo and Ely soils in narrow drainageways that dissect the uplands. Dickinson soils contain more sand than the Tama soils. Dinsdale soils have loam or clay loam glacial till at a depth of 24 to 40 inches. Downs soils have a thinner surface layer that has a lower content of organic matter than that of the Tama soils. Exette and Timula soils contain less clay in the subsoil than the Tama soils. Kenyon soils formed in loamy sediments and the underlying glacial till. Muscatine and Ely soils are somewhat poorly drained. Garwin and Colo soils are poorly drained. Colo and Ely soils formed in silty alluvium.

The Tama soils are used primarily for row crops. The main management concerns are erosion, fertility, and tilth. Installing a subsurface drainage system in areas of the included soils that are somewhat poorly drained or poorly drained helps to ensure that fieldwork is completed in a timely manner. Most of the nearly level to gently sloping soils are suited to row crops year after year. On the more sloping soils, a rotation of row crops with oats and hay helps to control erosion. Contour farming, terracing, and stripcropping also help to control erosion on the more sloping soils.

2. Muscatine-Tama-Garwin Association

Nearly level to moderately steep, well drained, somewhat poorly drained, and poorly drained soils formed in loess; on uplands

This association consists of nearly level to gently sloping soils on broad upland ridgetops and gently sloping to moderately steep soils on side slopes. The waterways throughout this association are smooth and broad. The soils formed in loess that is more than 40 inches thick.

This association makes up about 19 percent of the county. It is about 36 percent Muscatine soils, 28 percent Tama soils, 20 percent Garwin soils, and 16 percent minor soils (fig. 3).

The Muscatine soils are on broad upland ridgetops. They are nearly level to gently sloping. They are somewhat poorly drained. The Tama soils are on broad upland ridgetops and on side slopes. They are gently sloping to moderately steep. They are well drained. The

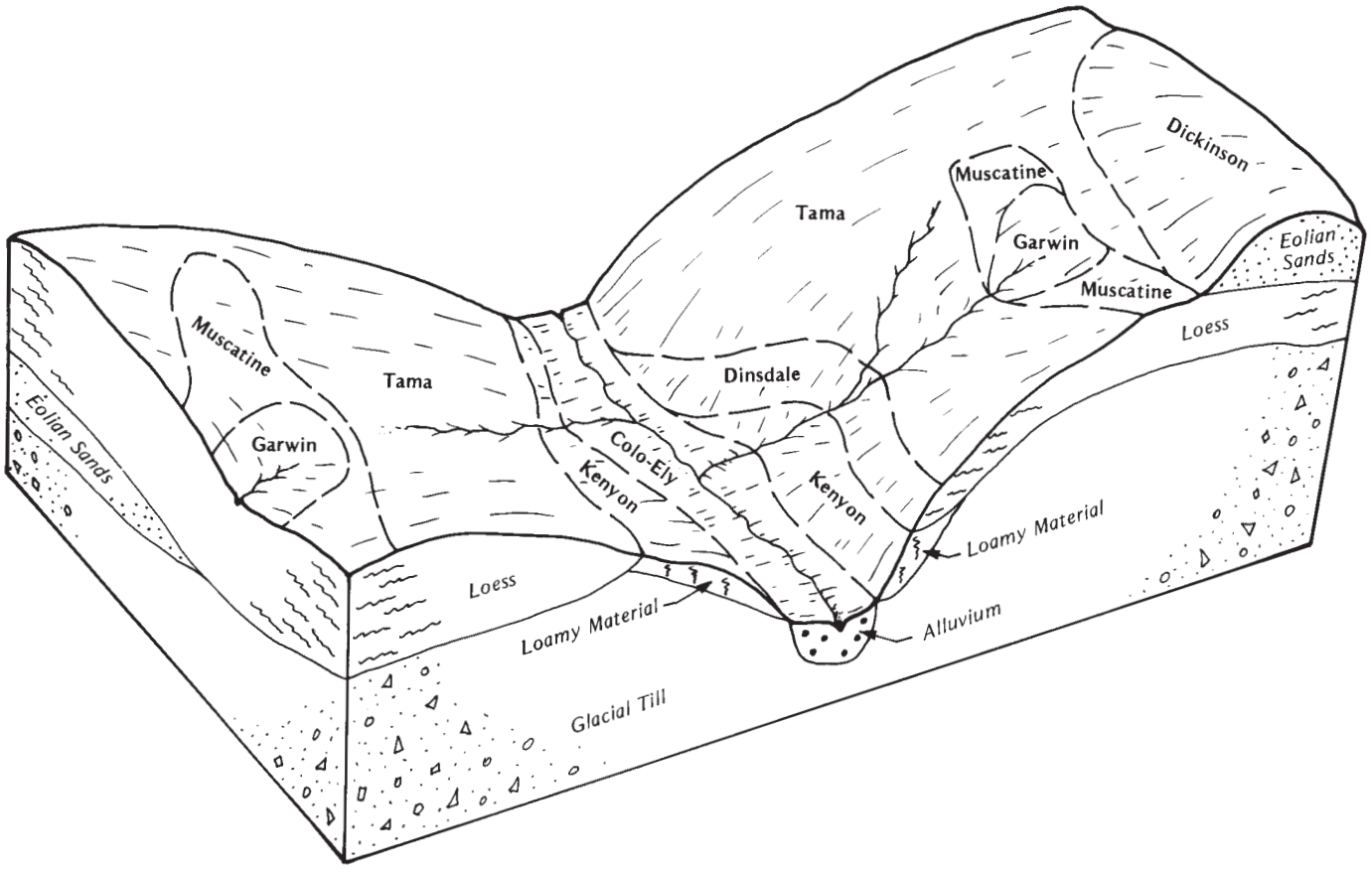

Figure 2.—Typical pattern of soils and parent material in the Tama association.

Garwin soils are on broad upland ridgetops. They are nearly level. They are poorly drained.

Typically, the surface layer of the Muscatine soils is black, friable silty clay loam about 10 inches thick. The subsurface layer is very dark brown, friable silty clay loam about 5 inches thick. The subsoil is friable silty clay loam about 39 inches thick. The upper part is dark grayish brown and mottled, and the lower part is grayish brown and mottled. The substratum to a depth of about 60 inches is grayish brown, mottled silt loam.

Typically, the surface layer of the Tama soils is very dark brown, friable silty clay loam about 8 inches thick. The subsurface layer is very dark brown and very dark grayish brown, friable silty clay loam about 11 inches thick. The subsoil to a depth of about 60 inches is friable silty clay loam. The upper part is brown, and the lower part is mottled yellowish brown.

Typically, the surface layer of the Garwin soils is black, friable silty clay loam about 9 inches thick. The subsurface layer also is black, friable silty clay loam about 9 inches thick. The subsoil to a depth of about 60 inches is dark gray, grayish brown, and light brownish gray, mottled, friable silty clay loam.

The minor soils in this association are the Atterberry, Colo, Dickinson, Dinsdale, Dockery, Ely, Killduff, Timula, and Walford soils. Atterberry soils are nearly level on upland ridgetops and are gently sloping at the head of drainageways and at the base of slopes. They have a lighter colored subsurface layer than that of the major soils. Colo and Ely soils are in drainageways and on foot slopes. They formed in alluvium. Dickinson soils contain more sand than the major soils. Dinsdale soils have loam or clay loam glacial till at a depth of 24 to 40 inches. Dockery soils are somewhat poorly drained. They are along streams and waterways. Killduff soils have less clay in the lower part of the subsoil than the major soils. Timula soils have less clay in the subsoil than the major soils. They are in coves along upland drainageways and on short, convex side slopes. Walford soils are nearly level. They are in slight depressions and have a lighter colored subsurface layer than that of the major soils.

The major soils in this association are well suited to row crops. Corn and soybeans are grown intensively on these soils. The main management concerns are controlling water erosion and maintaining tilth and fertility. A tile drainage system is needed in some of the poorly drained areas.

3. Downs-Fayette Association

Gently sloping to very steep, well drained soils formed in loess; on uplands

This association consists of gently sloping and moderately sloping soils on connected ridgetops and strongly sloping to very steep soils on side slopes. It is dissected by drainageways and streams, which form fingerlike networks throughout the association. Limestone bedrock outcrops in a few areas, especially in areas adjacent to major streams. The soils formed in loess that is more than 40 inches thick.

This association makes up about 19 percent of the county. It is about 35 percent Downs soils, 30 percent Fayette soils, and 35 percent minor soils (fig. 4).

Downs soils are gently sloping and moderately sloping on ridgetops and moderately sloping to steep on side slopes. Fayette soils are on ridgetops and side slopes. They are gently sloping to very steep.

Typically, the surface layer of the Downs soils is very dark grayish brown silt loam about 8 inches thick. The subsoil is friable silty clay loam about 45 inches thick. The upper part is dark yellowish brown, the next part is yellowish brown and brown and is mottled, and the lower part is mottled brown and grayish brown. The substratum to a depth of about 60 inches is mottled brown and grayish brown silty clay loam.

Typically, the surface layer of the Fayette soils is brown, friable silt loam about 6 inches thick. It is mixed with streaks and pockets of dark yellowish brown silty clay loam from the subsoil. The subsoil is friable silty

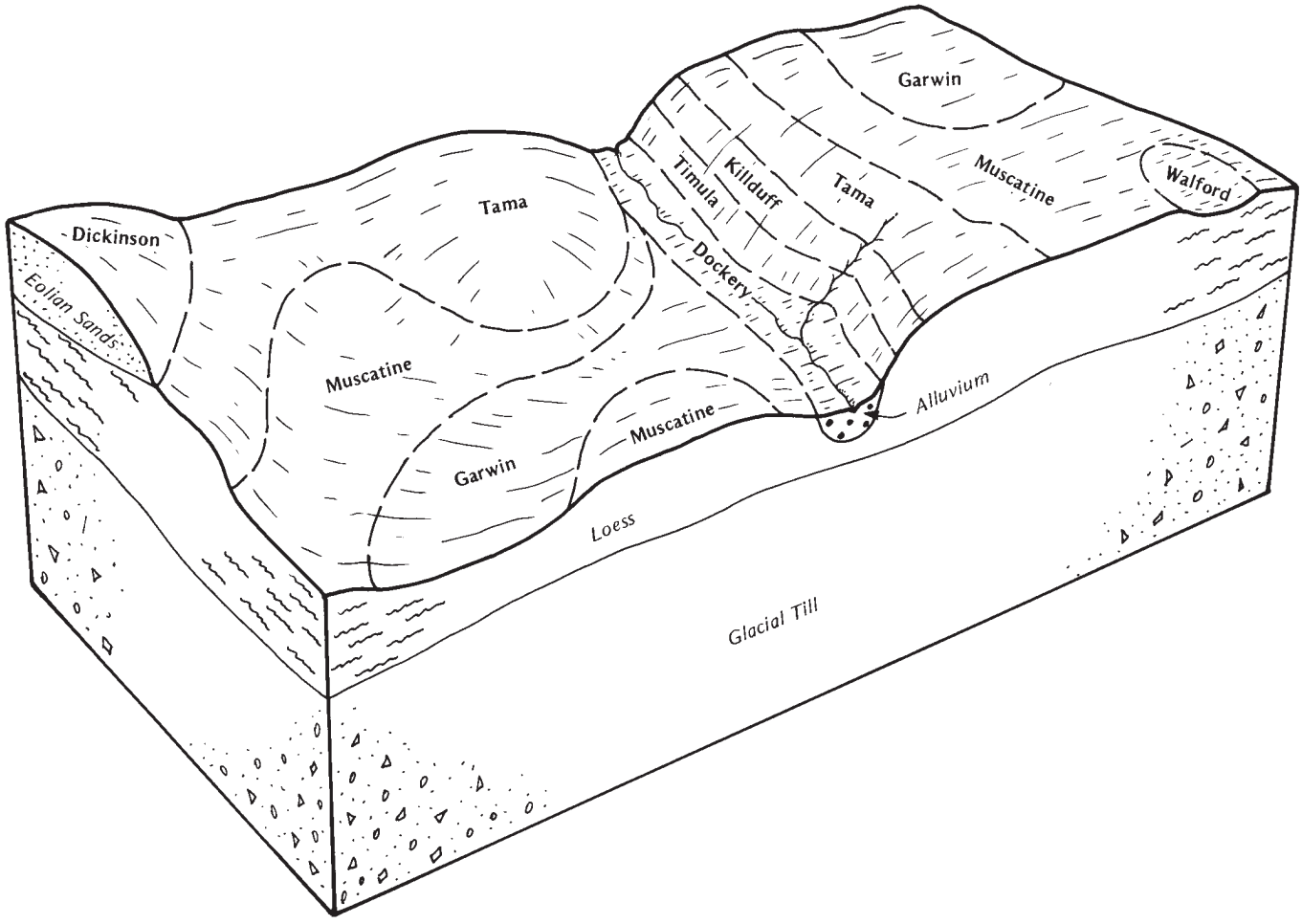

Figure 3.—Typical pattern of soils and parent material in the Muscatine-Tama-Garwin association.

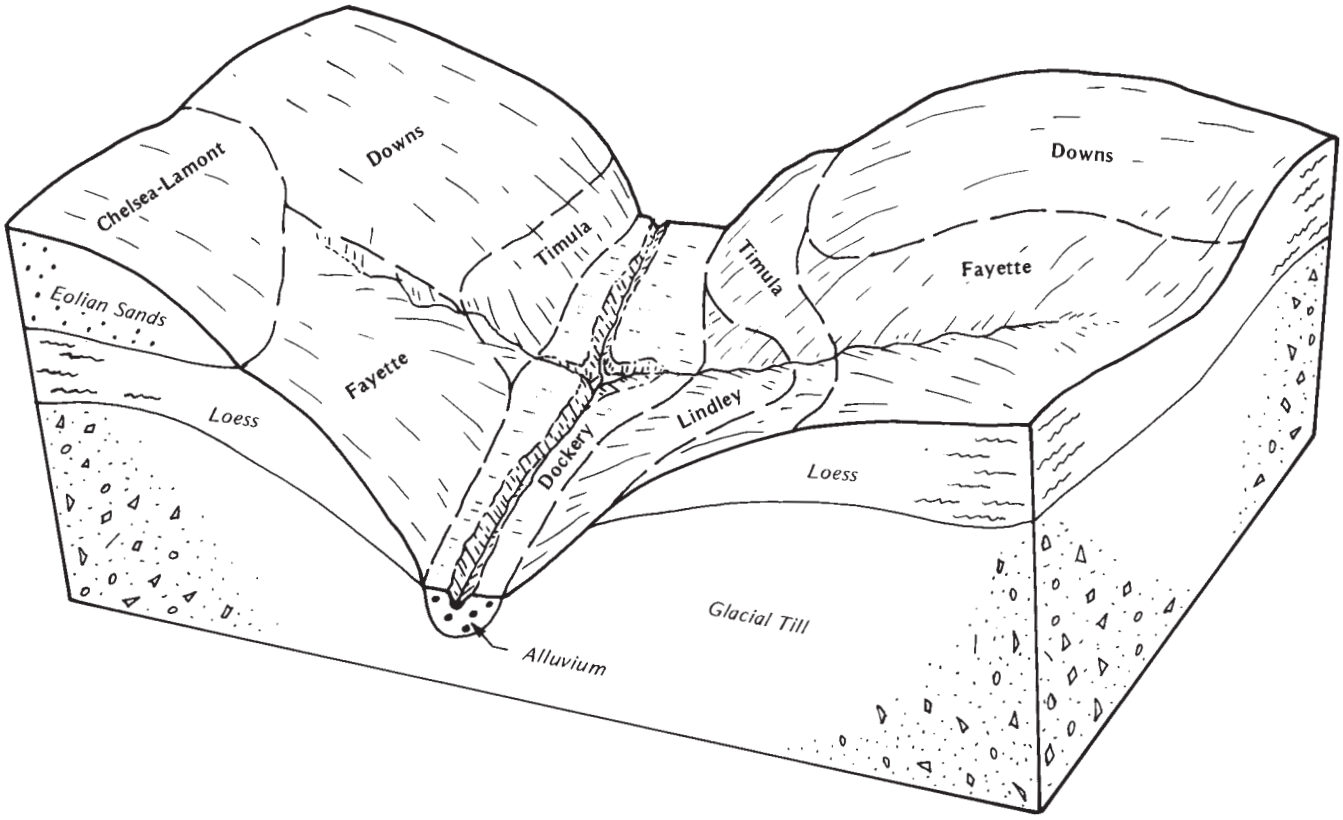

Figure 4.—Typical pattern of soils and parent material in the Downs-Fayette association.

clay loam about 49 inches thick. The upper part is dark yellowish brown, the next part is yellowish brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown and grayish brown, mottled silty clay loam.

The minor soils in this association are the Chelsea, Dockery, Exette, Lamont, Lindley, Nordness, and Timula soils. Dockery soils are somewhat poorly drained. They are along streams and waterways. Chelsea and Lamont soils are moderately steep and steep. They contain more sand than the major soils. Exette and Timula soils contain less clay in the subsoil than the major soils. Lindley soils formed in glacial till. They are on strongly sloping to very steep slopes.

Nearly all areas on the ridgetops and most of the areas on the side slopes are cultivated. Corn and soybeans are the main row crops. Alfalfa, red clover, and bromegrass are the main forage crops. Some areas are used as permanent pasture or woodland.

The gently sloping areas of Downs and Fayette soils are suited to row crops and small grain and to grasses and legumes for hay and pasture, but the steeper areas are subject to erosion. The steeper Fayette soils are better suited to permanent pasture or woodland. The main management concerns are controlling water erosion and maintaining tilth and fertility.

4. Dickinson-Sparta Association

Nearly level to strongly sloping, somewhat excessively drained and excessively drained soils formed in loamy and sandy eolian deposits; on uplands and stream terraces

This association consists of nearly level to strongly sloping soils. The soils are in the shape of dunes that have intervening swales. They are mainly along the Wapsipinicon River.

This association makes up about 4 percent of the county. It is about 30 percent Dickinson soils, 24 percent Sparta soils, and 46 percent soils of minor extent (fig. 5).

Dickinson soils are nearly level to moderately sloping. They are somewhat excessively drained. They are on ridges and side slopes. Sparta soils are nearly level to strongly sloping. They are excessively drained.

They are on mound-shaped ridges and side slopes.

Typically, the surface layer of the Dickinson soils is very dark brown, very friable fine sandy loam about 8 inches thick. The subsurface layer is very dark grayish brown, very friable fine sandy loam about 8 inches thick. The subsoil is about 31 inches thick. The upper part is dark brown and brown, very friable fine sandy loam; the next part is dark yellowish brown, very friable fine sandy loam; and the lower part is yellowish brown and dark yellowish brown, very friable loamy fine sand. The substratum to a depth of about 60 inches is yellowish brown loamy fine sand.

Typically, the surface layer of the Sparta soils is very dark brown, very friable loamy fine sand about 12 inches thick. The subsurface layer is very dark grayish brown, very friable loamy fine sand about 11 inches thick. The subsoil is very dark grayish brown, very friable fine sand about 13 inches thick. The substratum to a depth of about 60 inches is dark brown and dark yellowish brown sand and fine sand.

The minor soils in this association are the Aredale, Bolan, Clyde, and Kenyon soils. Aredale soils contain less sand and more clay than the major soils. They are on upland side slopes. Bolan soils contain more clay in the upper part of the solum than the major soils. They are in landscape positions similar to those of the major soils. Clyde soils are in nearly level to gently sloping swales. They are loamy and poorly drained. Kenyon soils are moderately well drained. They are on upland side slopes and ridgetops.

The soils in this association are used mostly for row crops. A few areas are used for hay and pasture, and a few are being planted to trees. The main management concerns are improving fertility and controlling soil blowing and water erosion. Most of the soils in this association are droughty, and yields are largely dependent on the amount and timeliness of rainfall.

5. Richwood-Rowley-Flagler Association

Nearly level, well drained, somewhat poorly drained, and somewhat excessively drained soils formed in loamy and silty alluvial sediments; on river terraces

This association consists of nearly level soils

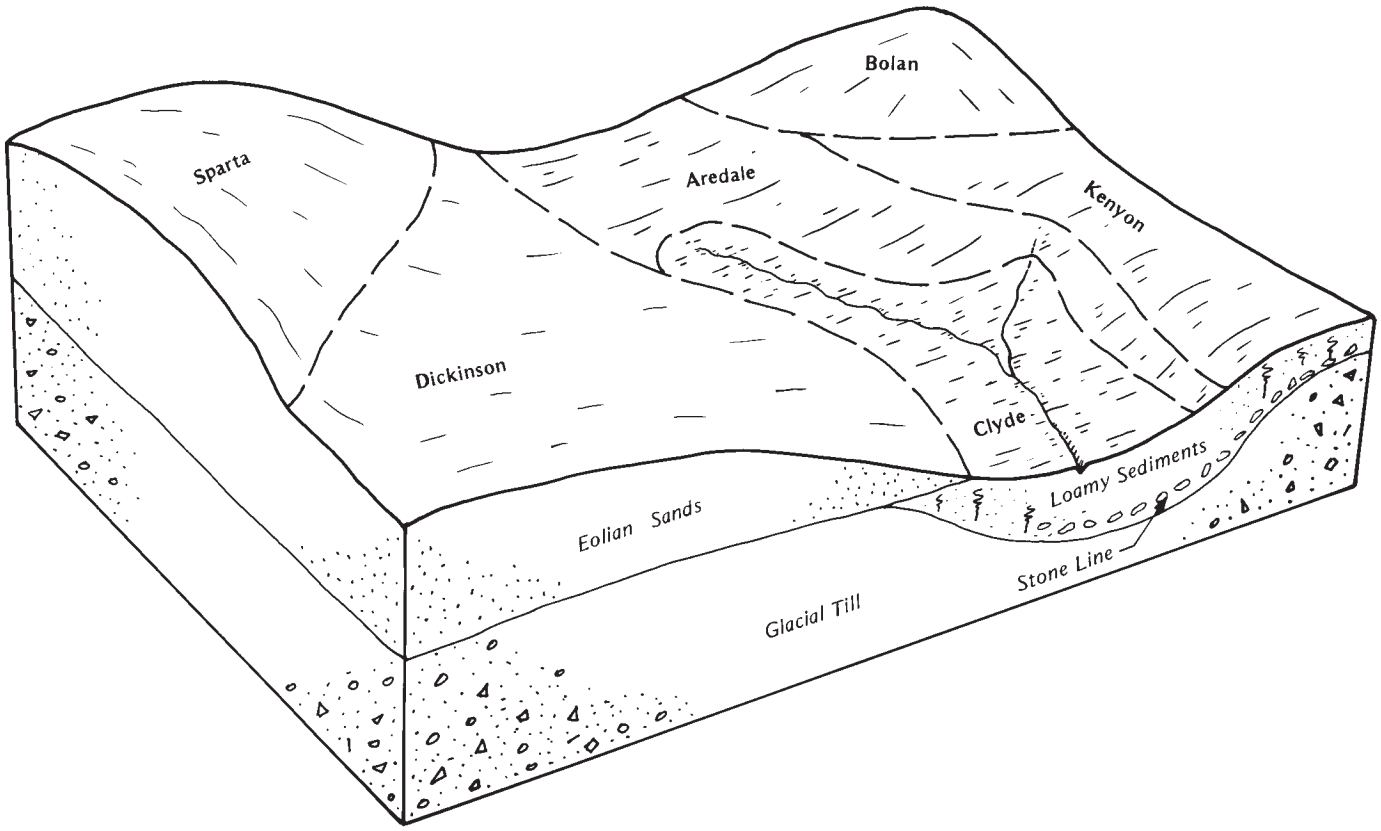

Figure 5.—Typical pattern of soils and parent material in the Dickinson-Sparta association.

bounded by uplands and by escarpments to flood plains.

This association makes up about 4 percent of the county. It is about 25 percent Richwood soils, 20 percent Rowley soils, 10 percent Flagler soils, and 45 percent minor soils.

Richwood and Rowley soils are on river and stream terraces. Richwood soils are well drained, and Rowley soils are somewhat poorly drained. Flagler soils are on river terraces. They are somewhat excessively drained.

Typically, the surface layer of the Richwood soils is very dark brown, friable silt loam about 9 inches thick. The subsurface layer is very dark grayish brown and dark brown, friable silt loam about 14 inches thick. The subsoil is dark yellowish brown, mottled, friable silt loam and silty clay loam about 35 inches thick. The substratum to a depth of about 65 inches is brown fine sand.

Typically, the surface layer of the Rowley soils is black, friable silt loam about 8 inches thick. The subsurface layer is black and very dark grayish brown, friable silt loam about 15 inches thick. The subsoil is grayish brown and light brownish gray, friable, mottled silt loam about 34 inches thick. The substratum to a depth of about 64 inches is brown fine sand.

Typically, the surface layer of the Flagler soils is very dark brown, very friable sandy loam about 9 inches thick. The subsurface layer is very dark grayish brown, very friable sandy loam about 7 inches thick. The subsoil is about 14 inches thick. The upper part is dark yellowish brown, mottled, very friable sandy loam, and the lower part is dark yellowish brown, dark brown, and brown, very friable loamy sand. The substratum to a depth of about 60 inches is yellowish brown and dark yellowish brown loamy sand and sand. It contains some fine gravel.

The minor soils in this association are the Bolan, Colo, Dickinson, Marshan, and Sparta soils. Bolan soils are well drained. Colo and Marshan soils are poorly drained. Dickinson soils do not contain gravel or contain only a limited amount of gravel. They are somewhat excessively drained. Sparta soils are excessively drained. They contain less clay than the major soils. Bolan, Dickinson, Marshan, and Sparta soils are in landscape positions similar to those of the major soils. Colo soils are on flood plains.

The major soils in this association are well suited to row crops. Corn and soybeans are grown intensively. The main management concerns are controlling soil blowing and maintaining tilth and fertility. A tile drainage system is needed in the poorly drained areas.

6. Colo-Lawson-Nodaway Association

Nearly level, poorly drained to moderately well drained soils formed in silty alluvium; on flood plains

This association consists of nearly level, silty soils on flood plains. The soils are in major stream valleys that dissect the uplands in various parts of the county.

This association makes up about 6 percent of the county. It is about 35 percent Colo soils, 12 percent Lawson soils, 12 percent Nodaway soils, and 41 percent soils of minor extent.

Colo soils are poorly drained. They are on flood plains adjacent to upland soils that formed under prairie vegetation. Lawson soils are somewhat poorly drained. They are on flood plains along the major streams and rivers. Nodaway soils are moderately well drained. They are near streams or on flood plains adjacent to upland soils that formed under forest vegetation.

Typically, the surface layer of the Colo soils is black, friable silty clay loam about 11 inches thick. The subsurface layer is black, friable silty clay loam about 20 inches thick. The subsoil to a depth of about 60 inches is friable, mottled silty clay loam. The upper part is very dark gray and dark gray, and the lower part is grayish brown.

Typically, the surface layer of the Lawson soils is black, friable silt loam about 8 inches thick. The subsurface layer is black and very dark gray, friable silt loam about 27 inches thick. The substratum to a depth of about 60 inches is stratified very dark gray, black, and dark grayish brown, mottled silt loam.

Typically, the surface layer of the Nodaway soils is very dark grayish brown, friable silt loam about 10 inches thick. The substratum to a depth of about 60 inches is stratified dark grayish brown, brown, dark brown, and very dark grayish brown, friable silt loam.

The minor soils in this association are the Ambraw, Perks, Rowley, and Shaffton soils. Ambraw, Perks, and Shaffton soils contain more sand than the major soils. Ambraw soils are poorly drained, Perks soils are excessively drained, and Shaffton soils are somewhat poorly drained. Rowley soils are on low stream terraces. They are somewhat poorly drained.

The soils in this association are used for row crops, hay, and pasture. Most of the soils are subject to flooding and have a seasonal high water table. The major management concerns in many areas of the soils are improving fertility and drainage. Protecting the soils from flooding and installing a surface drainage system are beneficial in some areas.

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 map symbols consist of numbers or a combination of numbers and a letter. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 following the slope letter indicates that the soil is moderately eroded. Only 3 to 7 inches of the A horizon or the A and E horizons remains. Some of the AB and B horizons are mixed with the surface layer in soils that have been tilled. A final number of 3 following the slope letter indicates that the soil is severely eroded. Less than 3 inches of the A horizon or the A and E horizons remains. Most of the present surface layer, which is much lighter in color than the original surface layer, consists of the Ap, B, or C horizon in areas that have been tilled. A plus symbol at the end of the map symbol indicates a deposition of overwash material. From 8 to 18 inches of light colored sediment has recently been deposited on the existing A horizon. Symbols without a final number of 2 or 3 or a plus sign indicate that only slight erosion or no erosion has occurred. More than 7 inches of the A horizon or the A and E horizon remains.

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

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

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Colo-Ely complex, 0 to 5 percent slopes, is an example.

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

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

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

11B—Colo-Ely complex, 0 to 5 percent slopes. These nearly level and gently sloping soils are on foot slopes, alluvial fans, and narrow flood plains, mainly

along small streams in the uplands. The poorly drained Colo soil is near stream channels. It is occasionally flooded for very brief to long periods. The somewhat poorly drained Ely soil is at the base of upland slopes. Areas range from 5 to more than 50 acres in size and are long and narrow. They are about 50 percent Colo soil and 35 percent Ely soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Colo soil has a surface layer of black, friable silty clay loam about 11 inches thick. The subsurface layer is black, friable silty clay loam about 20 inches thick. The subsoil to a depth of about 60 inches is friable, mottled silty clay loam. The upper part is very dark gray and dark gray, and the lower part is grayish brown.

Typically, the Ely soil has a surface layer of black, friable silty clay loam about 9 inches thick. The subsurface layer is black, very dark gray, and very dark grayish brown, friable silty clay loam about 20 inches thick. The upper part of the subsoil is dark grayish brown, mottled, friable silty clay loam. The lower part to a depth of about 60 inches is grayish brown and light brownish gray, mottled, friable silty clay loam.

Included with these soils in mapping are areas of soils that have a surface layer of lighter colored silt loam and a lower content of organic matter in the surface layer than the Colo and Ely soils. Included soils make up about 15 percent of the unit.

Permeability is moderate in the Colo and Ely soils. Surface runoff is slow on the Colo soil and medium on the Ely soil. Available water capacity is high in both soils. The Colo soil has a seasonal high water table at a depth of 1 to 3 feet, and the Ely soil has one at a depth of 2 to 4 feet. The content of organic matter is 5 to 7 percent in the surface layer of the Colo soil and 5 to 6 percent in the surface layer of the Ely soil. The substratum of the Colo soil has a medium supply of available phosphorus and a very low supply of available potassium. The substratum of the Ely soil has a low supply of available phosphorus and potassium.

Most areas are cultivated. Many small areas of these soils are cropped along with areas of adjacent soils. Some areas are used for permanent pasture. These soils are well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Wetness is the main limitation. Some areas receive runoff from side slopes and thus are subject to siltation. Applying a system of conservation tillage that leaves crop residue on the surface, contour farming, and terracing help to control runoff in the higher areas. Areas near small streams are subject to flooding. Diversions and channel improvements help to control the floodwater and the runoff from adjacent side slopes. Grassed waterways help to control erosion and prevent gullying. A drainage system improves the timeliness of fieldwork and helps to maintain tilth.

The forage species that can tolerate the wetness grow best in the more level areas. They include birdsfoot trefoil, orchardgrass, red clover, and timothy. The better drained soils on side slopes are suited to most forage species. Overwash and silt from adjacent soils can damage hay and pasture if conservation measures are not applied to soils upslope. Restricting grazing and equipment use during wet periods minimizes compaction and thus helps to maintain tilth and control runoff. Pasture rotation is beneficial.

The land capability classification is IIw.

20C2—Killduff silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on narrow, convex side slopes and at the head of drainageways in the uplands. Areas range from 5 to 20 acres in size. They are elongated and irregularly shaped.

Typically, the surface layer is very dark grayish brown and dark brown, friable silty clay loam about 8 inches thick. It is mixed with streaks and pockets of subsoil material. The subsoil is friable silty clay loam about 44 inches thick. The upper part is mottled light brownish gray and yellowish brown, and the lower part is light brownish gray and mottled. The substratum to a depth of about 60 inches is light brownish gray, mottled silt loam.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. It can be controlled, however, by contour farming, a system of conservation tillage that leaves crop residue on the surface, and grassed waterways. Slopes generally are not long enough and uniform enough for terracing. Grassed waterways help to prevent the formation of gullies. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Most forage species grow well on this soil. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use

during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the quality of the stand and the fertility of the soil.

The land capability classification is IIIe.

20C3—Killduff silty clay loam, 5 to 9 percent slopes, severely eroded. This moderately sloping, moderately well drained soil is on narrow, convex side slopes and at the head of drainageways in the uplands. Areas range from 10 to 40 acres in size. They are elongated and irregularly shaped.

Typically, the surface layer is brown and dark yellowish brown, friable silty clay loam about 7 inches thick. About 10 to 15 percent of the surface layer is streaks and pockets of dark brown material from the original surface layer. The subsoil is friable silty clay loam about 38 inches thick. The upper part is mottled yellowish brown and light brownish gray, and the lower part is mottled light brownish gray and yellowish brown. The substratum to a depth of about 60 inches is mottled light brownish gray and yellowish brown silt loam.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is about 1 to 2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. It can be controlled, however, by contour farming, a system of conservation tillage that leaves crop residue on the surface, and grassed waterways. Slopes generally are not long enough and uniform enough for terracing. Grassed waterways help to prevent the formation of gullies. More intense management and more nitrogen are needed on this soil than on the less eroded Killduff soils to maintain productivity and improve tilth. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Most forage species grow well on this soil. Reseeding may be difficult because the surface layer is silty clay loam and is lower in organic matter content than that of the less eroded Killduff soils. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the quality of the stand and the fertility of the soil.

The land capability classification is IIIe.

20D2—Killduff silty clay loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained soil is on narrow, convex side slopes in the uplands. Areas range from 10 to 40 acres in size and are elongated.

Typically, the surface layer is dark brown, friable silty clay loam about 7 inches thick. It is mixed with streaks and pockets of brown and yellowish brown material from the subsoil. The subsoil is about 31 inches thick. It is mottled light brownish gray and yellowish brown and is friable. The upper part is silty clay loam, and the lower part is silt loam. The substratum to a depth of about 60 inches is mottled yellowish brown and light brownish gray silt loam.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. It can be controlled, however, by contour farming, a system of conservation tillage that leaves crop residue on the surface, and grassed waterways. Slopes generally are not long enough and uniform enough for terracing. Grassed waterways help to prevent the formation of gullies. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Most forage species grow well on this soil. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the quality of the stand and the fertility of the soil.

The land capability classification is IIIe.

20D3—Killduff silty clay loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, moderately well drained soil is on narrow, convex side slopes in the uplands. Areas range from 10 to 40 acres in size and are elongated.

Typically, the surface layer is brown and yellowish brown, friable silty clay loam about 7 inches thick. About 10 to 15 percent of the surface layer is streaks and pockets of dark brown material from the original surface layer. The subsoil is about 31 inches thick. It is mottled yellowish brown and light brownish gray and is friable. The upper part is silty clay loam, and the lower part is silt loam. The substratum to a depth of about 60 inches is mottled yellowish brown and light brownish gray silt loam.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 1 to 2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. It can be controlled, however, by contour farming, a system of conservation tillage that leaves crop residue on the surface, and grassed waterways. Slopes generally are not long enough and uniform enough for terracing. Grassed waterways help to prevent the formation of gullies. More intense management and more nitrogen are needed on this soil than on the less eroded Killduff soils to maintain productivity and improve tilth. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Most forage species grow well on this soil. Reseeding may be difficult because the surface layer is silty clay loam and is lower in organic matter content than that of the less eroded Killduff soils. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the quality of the stand and the fertility of the soil.

The land capability classification is IVe.

24D3—Shelby clay loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, well drained soil is on convex side slopes in the uplands. Areas range from 5 to 30 acres in size and are irregularly shaped.

Typically, the surface layer is brown, friable clay loam about 6 inches thick. It is mixed with streaks and pockets of very dark grayish brown material from the original surface layer. The subsoil is clay loam about 41 inches thick. The upper part is dark brown and friable; the next part is yellowish brown, mottled, and firm; and the lower part is yellowish brown and grayish brown, mottled, and firm. The substratum to a depth of about 60 inches is mottled grayish brown and dark yellowish brown clay loam. Pebbles are in the subsoil and substratum. In some places the surface layer is more than 7 inches thick. In other places stones and pebbles are on the surface. In places the soil contains more clay and has redder mottles.

Permeability is moderately slow, and runoff is rapid. Available water capacity is high. The organic matter content of the surface layer is 1 to 2 percent. The subsoil generally has a very low supply of available phosphorus and potassium.

Some areas are cultivated. Some large areas are pastured. In most areas this soil is managed along with adjacent soils. It is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses for hay and pasture. If cultivated crops are grown, erosion is a severe hazard. It can be controlled, however, by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. The stones on the surface in some areas can result in damage to farm equipment unless they are removed. Returning crop residue to the soil or regularly adding other organic material and deferring tillage when the soil is wet help to maintain tilth, improve fertility, prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Reseeding may be difficult because the organic matter content is lower in this soil than in less eroded Shelby soils. Overgrazing causes surface compaction and poor tilth, increases the runoff rate, and reduces forage production. The soil is suited to most forage species. Proper stocking rates, pasture rotation, and timely deferment of grazing when the soil is wet help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby increases the fertility of the soil.

The land capability classification is IVe.

24E2—Shelby loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is on convex side slopes in the uplands. Areas range from 5 to 30 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, friable loam about 6 inches thick. It is mixed with streaks and pockets of dark brown material from the subsoil. The subsoil is clay loam about 28 inches thick. The upper part is dark brown and friable; the next part is dark yellowish brown and friable; and the lower part is

brown, mottled, and firm. The substratum to a depth of about 60 inches is mottled grayish brown and dark yellowish brown clay loam. Pebbles are in the subsoil and substratum. In some places the surface layer is more than 7 inches thick. In other places stones and pebbles are on the surface. In places the soil contains more clay and has redder mottles.

Permeability is moderately slow, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 1.5 to 2.5 percent. The subsoil generally has a very low supply of available phosphorus and potassium.

Some areas are cultivated. Some large areas are pastured. In most areas this soil is managed along with adjacent soils. It is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. It can be controlled, however, by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. The stones on the surface in some areas can result in damage to farm equipment unless they are removed. Returning crop residue to the soil or regularly adding other organic material and deferring tillage when the soil is wet help to maintain tilth, improve fertility, prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Overgrazing causes surface compaction and poor tilth, increases the runoff rate, and reduces forage production. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, and timely deferment of grazing when the soil is wet help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby increases the fertility of the soil.

The land capability classification is IVe.

24E3—Shelby clay loam, 14 to 18 percent slopes, severely eroded. This moderately steep, well drained soil is on convex side slopes in the uplands. Areas range from 5 to 30 acres in size and are irregularly shaped.

Typically, the surface layer is dark yellowish brown and yellowish brown, friable clay loam about 6 inches thick. About 10 to 15 percent of the surface layer is streaks and pockets of dark brown material from the original surface layer. The subsoil is clay loam about 41 inches thick. The upper part is yellowish brown and friable; the next part is yellowish brown, mottled, and firm; and the lower part is mottled yellowish brown and grayish brown and firm. The substratum to a depth of about 60 inches is mottled grayish brown and yellowish brown clay loam. Pebbles are in the subsoil and substratum. In some places stones and pebbles are on the surface. In other places the soil contains more clay and has redder mottles.

Permeability is moderately slow, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 1 to 2 percent. The subsoil generally has a very low supply of available phosphorus and potassium.

Some areas are cultivated. Some large areas are pastured. In most areas this soil is managed along with adjacent soils. It is not suited to cultivated crops. It is moderately well suited to small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a severe hazard. It can be controlled, however, by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. The stones on the surface in some areas can result in damage to farm equipment unless they are removed. More intense management is needed on this soil than on the less eroded Shelby soils to maintain productivity. Returning crop residue to the soil or regularly adding other organic material and deferring tillage when the soil is wet help to maintain tilth, improve fertility, prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Reseeding may be difficult because the organic matter content is lower in this soil than in less eroded Shelby soils. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

The land capability classification is VIe.

41—Sparta loamy fine sand, 0 to 2 percent slopes. This nearly level, excessively drained soil is on stream terraces and in the uplands. Areas range from 10 to 30 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, very friable loamy fine sand about 12 inches thick. The subsurface layer is very dark grayish brown, very friable loamy fine sand about 11 inches thick. The subsoil is very dark grayish brown, very friable fine sand about 13 inches thick. The substratum to a depth of about 60 inches is dark brown and dark yellowish brown fine sand and sand.

Included with this soil in mapping are small areas of soils that have a dark grayish brown subsoil. These soils have a higher water table than the Sparta soil. They are in low areas and in drainageways. They make up less than 5 percent of the unit.

Permeability of this Sparta soil is rapid, and runoff is slow. Available water capacity is low. The content of organic matter in the surface layer is 1 to 2 percent. The substratum generally has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. Droughtiness is a limitation in most years unless rainfall is timely. If cultivated crops are grown, soil blowing is a hazard. A system of conservation tillage that leaves crop residue on the surface and contour farming conserve moisture and help to control erosion. The hazard of soil blowing is increased if the soil is plowed in the fall. It can be reduced, however, by leaving the surface rough, by alternating plowed and unplowed strips, and by chisel plowing in areas where crop residue is left on the surface. Chisel plowing also conserves moisture. Good tilth generally can be easily maintained. Returning crop residue to the soil or regularly adding other organic material helps to maintain tilth and improve fertility.

A cover of pasture plants or hay helps to control erosion. Managing the pasture is difficult, however, because of the droughtiness. Permanent pasture can be improved by renovating and reseeding. Once the permanent pasture has been established, proper stocking rates, pasture rotation, timely deferment of grazing, especially during dry periods, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IVs.

41B—Sparta loamy fine sand, 2 to 5 percent slopes. This gently sloping, excessively drained soil is on convex upland slopes and on stream terraces. Areas range from 10 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, very friable loamy fine sand about 12 inches thick. The subsurface layer is very dark grayish brown, very friable loamy fine sand about 11 inches thick. The subsoil is very dark grayish brown, very friable fine sand about 13 inches thick. The substratum to a depth of about 60 inches is dark brown and dark yellowish brown sand and fine sand. In some places the surface layer is very dark brown and dark brown, friable fine sandy loam. In other places it is less than 10 inches thick.

Permeability is rapid, and runoff is slow. Available water capacity is low. The content of organic matter in the surface layer is 1 to 2 percent. The subsoil generally has a very low supply of available phosphorus and potassium.

Most areas are cultivated or pastured. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. Droughtiness is a limitation in most years unless rainfall is timely. Plants respond poorly to applications of fertilizer. If cultivated crops are grown, soil blowing and water erosion are hazards. Soil blowing can result in damage to seedlings on this soil and on the adjacent soils. A system of conservation tillage that leaves crop residue on the surface helps to prevent excessive soil loss. The soil is poorly suited to terracing. Tilth generally is poor in the surface layer because of the low content of organic matter and because the soil structure breaks down easily.

A cover of pasture plants or hay helps to control erosion. Managing the pasture is difficult, however, because of the droughtiness. Permanent pasture can be improved by renovating and reseeding. Once the permanent pasture has been established, proper stocking rates, pasture rotation, timely deferment of grazing, especially during dry periods, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IVs.

41C—Sparta loamy fine sand, 5 to 9 percent slopes. This moderately sloping, excessively drained soil generally is in areas adjacent to drainageways and in isolated areas on uplands. In a few areas it is on dunelike ridges that are oriented from the northwest to the southeast. Generally, areas range from 3 to 10 acres in size and are irregularly shaped, but in some places on the ridges, they range from 10 to 20 acres in size and are long and narrow.

Typically, the surface layer is brown, very friable loamy fine sand about 9 inches thick. The subsurface layer is dark brown, very friable loamy fine sand about 5 inches thick. The subsoil is dark brown and yellowish brown, very loamy fine sand about 10 inches thick. The substratum to a depth of about 60 inches is yellowish brown sand.

Included with this soil in mapping are areas where the soils are gravelly loamy sand or gravelly sandy loam. These soils are in landscape positions similar to those of the Sparta soil. They are lower in organic matter content than the Sparta soil and have a lower available water capacity. They make up less than 5 percent of the unit.

Permeability of this Sparta soil is rapid, and runoff is slow. Available water capacity is low. The content of

organic matter in the surface layer is 1 to 2 percent. The surface layer generally has a very low supply of available phosphorus and potassium.

Most areas are pastured. A few small areas of this soil are mapped along with larger areas of adjacent soils that are well suited to cultivated crops. This soil is poorly suited to cultivated crops and is moderately suited to small grain and to grasses and legumes for hay and pasture. Droughtiness is a severe limitation in most years unless rainfall is timely. If cultivated crops are grown, soil blowing is a severe hazard. Good tilth generally can be easily maintained.

A cover of pasture plants or hay helps to control erosion. Managing the pasture is difficult, however, because of the droughtiness. Permanent pasture can be improved by renovating and reseeding. Once the permanent pasture has been established, proper stocking rates, pasture rotation, timely deferment of grazing, especially during dry periods, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IVs.

41D—Sparta loamy fine sand, 9 to 14 percent slopes. This strongly sloping, excessively drained soil is on convex upland slopes and on stream benches. Areas range from 5 to 20 acres in size and are irregularly shaped.

Typically, the surface layer is dark brown, very friable loamy fine sand about 6 inches thick. The subsurface layer is dark brown, very friable loamy fine sand about 8 inches thick. The subsoil is brown, very friable fine sand about 6 inches thick. The substratum to a depth of about 60 inches is yellowish brown and light yellowish brown sand and fine sand. In some places the surface layer is very dark brown and dark brown, friable fine sandy loam. In other places the surface soil is less than 10 inches thick.

Included with this soil in mapping are areas where the soils are gravelly loamy sand or gravelly sandy loam. These soils are in landscape positions similar to those of the Sparta soil. They are lower in organic matter content than the Sparta soil and have a lower available water capacity. They make up about 5 to 10 percent of the unit.

Permeability of this Sparta soil is rapid, and runoff is medium. Available water capacity is low. The content of organic matter in the surface layer is 1 to 2 percent. The subsoil generally has a very low supply of available phosphorus and potassium.

Most areas are pastured. This soil is unsuited to corn, soybeans, and small grain and is only moderately suited to hay and pasture. Soil blowing can result in damage to seedlings on this soil and on the adjacent soils. The soil is poorly suited to terracing. Tilth generally is poor in the surface layer because of the low content of organic matter and because the soil aggregates break down easily.

A cover of pasture plants or hay helps to control erosion. Managing the pasture is difficult, however, because of the droughtiness. Permanent pasture can be improved by renovating and reseeding. Once the permanent pasture has been established, proper stocking rates, pasture rotation, timely deferment of grazing, especially during dry periods, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIs.

54—Zook silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is at the lower elevations on flood plains. It is occasionally flooded for brief or long periods. Areas range from 5 to 100 acres in size and are wide and irregularly shaped.

Typically, the surface layer is black, firm silty clay loam about 8 inches thick. The subsurface layer is firm silty clay about 25 inches thick. The upper part is black, and the lower part is very dark gray. The subsoil is very dark gray, mottled, firm silty clay about 12 inches thick. The substratum to a depth of about 60 inches is dark gray, mottled silty clay. In some places the surface layer is overlain by about 12 inches of recently deposited silt loam. In other places it is silty clay. In some areas the subsoil contains more clay, and in other areas it contains less clay.

Permeability and runoff are slow. Available water capacity is high. The seasonal high water table is within a depth of 3 feet. The content of organic matter in the surface layer is 5 to 7 percent. The subsoil generally has a moderate supply of available potassium and a low supply of phosphorus.

Most areas are cultivated. If drained, this soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. A drainage system is needed to reduce the wetness and provide good aeration and a deep root zone for plants. Tile drains generally work satisfactorily if they are closely spaced and if an adequate outlet is available. Surface drains are needed to remove surface water in some areas because tile drains may function slowly. Tilth generally is fair in the surface layer. Returning crop residue to the soil and deferring tillage when the soil is wet help to maintain tilth.

A cover of pasture plants or hay helps to control soil blowing. Unless the soil is drained, forage production is limited to those crop mixtures that are tolerant of the wetness. An example of such a mixture is birdsfoot trefoil and tall fescue or red clover and timothy.

Restricting grazing and equipment use during wet periods minimizes compaction and thus helps to maintain tilth and productivity. Pasture rotation is beneficial.

The land capability classification is IIw.

63C—Chelsea loamy fine sand, 5 to 9 percent slopes. This moderately sloping, excessively drained soil is on moundlike ridges and convex side slopes in the uplands that generally are adjacent to a stream valley. It also is on alluvial terraces. Areas range from 10 to 20 acres in size and are irregularly shaped or round.

Typically, the surface layer is brown, very friable loamy fine sand about 8 inches thick. The subsurface layer is about 42 inches thick. The upper part is dark yellowish brown, very friable loamy fine sand, and the lower part is yellowish brown, loose loamy fine sand and fine sand. Below this to a depth of about 60 inches is brown, loose fine sand that has 0.25- to 1.25-inch-thick bands of brown loamy fine sand.

Included with this soil in mapping are small areas of the well drained Lamont soils. These soils are in landscape positions similar to those of the Chelsea soil. They have a slightly higher available water capacity than the Chelsea soil. They make up 5 to 10 percent of the unit.

Permeability of this Chelsea soil is rapid, and runoff is slow. Available water capacity is low. The content of organic matter in the surface layer is less than 1 percent. The subsurface layer generally has a very low supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated. A few small areas of this soil are cultivated along with larger areas of adjacent soils that are well suited to crops. This soil is poorly suited to corn and soybeans and is moderately suited to small grain and to grasses and legumes for hay and pasture. Droughtiness is a severe limitation in most years unless rainfall is timely. If cultivated crops are grown, soil blowing is a hazard. The erosion begins on round, convex shoulder slopes. Soil blowing can result in damage to seedlings on this soil and on the adjoining soils unless the surface is protected by a plant cover. A system of conservation tillage that leaves crop residue on the surface and cover crops help to prevent excessive soil loss. The soil warms up quickly in the spring, thus stimulating early plant growth, particularly on south- and east-facing slopes. Good tilth generally can be easily maintained. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the available water capacity.

A cover of pasture plants or hay helps to control erosion. Managing the pasture is difficult, however, because of the droughtiness. Permanent pasture can be improved by renovating and reseeding. Once the permanent pasture has been established, proper stocking rates, pasture rotation, timely deferment of grazing, especially during dry periods, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IVs.

63E—Chelsea loamy fine sand, 9 to 18 percent slopes. This strongly sloping and moderately steep, excessively drained soil is on moundlike ridges and on convex slopes in the uplands and on stream terraces. Areas range from 5 to 10 acres in size and are irregularly shaped.

Typically, the surface layer is brown, very friable loamy fine sand about 8 inches thick. The subsurface layer is dark yellowish brown and yellowish brown, loose loamy sand and fine sand about 40 inches thick. Below this to a depth of about 60 inches is yellowish brown, loose fine sand that has 0.25- to 1.25-inch-thick bands of brown loamy fine sand. In places the surface layer is brown fine sand.

Included with this soil in mapping are small areas of soils that are underlain by coarse sand and gravel. These soils are on escarpments. They make up less than 5 percent of the unit.

Permeability of this Chelsea soil is rapid, and runoff is medium. Available water capacity is low. The content of organic matter in the surface layer is less than 1 percent. The subsoil generally has a very low supply of available phosphorus and a low supply of available potassium.

Most areas are pastured. This soil is not suited to cultivated crops and is poorly suited to hay and pasture, mainly because it is droughty, low in fertility, and moderately steep. It also is subject to soil blowing. As a result, a permanent plant cover is needed. Tilth generally is poor because of the low content of organic matter and because the soil structure breaks down easily.

A cover of pasture plants or hay helps to control erosion. Overgrazing or grazing when the soil is too wet or too dry reduces the extent of the protective plant cover and causes deterioration of the plant community. Proper stocking rates, pasture rotation, and timely deferment of grazing, especially during dry periods, help to keep the pasture in fairly good condition.

The land capability classification is VIIs.

65E2—Lindley loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is on side slopes in the uplands (fig. 6).

Figure 6.—Typical area of Lindley loam, 14 to 18 percent slopes, moderately eroded.

Areas range from 5 to 100 acres in size and are irregularly shaped.

Typically, the surface layer is dark grayish brown, friable loam about 7 inches thick. It is mixed with streaks and pockets of dark yellowish brown loam from the subsoil. The subsoil is about 51 inches thick. The upper part is dark yellowish brown, friable loam, and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In some places the surface layer is brown clay loam. In other places, the soil may be seepy and the subsoil is reddish brown or yellowish red and contains more clay.

Permeability is moderately slow, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 1.5 to 2.5 percent. The surface layer generally has a low supply of available phosphorus and potassium.

Most areas are used for pasture or hay but have been cultivated in the past. This soil is unsuited to cultivated crops because of the slope and a severe hazard of erosion. It is moderately suited to grasses and legumes for hay and pasture.

A cover of pasture plants or hay helps to control

erosion. Pasture in some of the steeper areas may need to be reseeded or renovated. Preparing a seedbed, however, is difficult. Because of the slope, operating farm machinery is difficult and dangerous. Caution is needed when operating the machinery. Overgrazing or grazing when the soil is too wet causes surface compaction and deterioration of tilth and increases the runoff rate. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIe.

65F—Lindley loam, 18 to 25 percent slopes. This steep, well drained soil is on short, convex side slopes and nose slopes in the uplands. Areas range from 5 to 10 acres in size and are elongated.

Typically, the surface layer is very dark grayish brown, friable loam about 4 inches thick. The subsurface layer is brown, friable loam about 5 inches thick. The subsoil is yellowish brown, mottled, firm clay loam about 38 inches thick. The substratum to a depth of about 60 inches is yellowish brown and strong brown clay loam. In places the surface layer is brown and yellowish brown loam.

Included with this soil in mapping are small areas of soils that are red or gray clay. These soils are on the higher part of the side slopes. Water seeps from these areas during extended wet periods. Included soils make up 2 to 6 percent of the unit.

Permeability of this Lindley soil is moderately slow, and runoff is very rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are used as permanent pasture or woodland or for wildlife. This soil is unsuited to cultivated crops because erosion is a severe hazard and the slope is too steep for the operation of ordinary farm machinery in some areas. The soil is poorly suited to hay and pasture.

A cover of pasture plants or hay helps to control erosion; however, production may be low. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIIe.

65G—Lindley loam, 25 to 40 percent slopes. This very steep, well drained soil is on dissected, convex side slopes in the uplands that are adjacent to major streams. Areas range from 20 to 40 acres in size. The soil is in long, narrow bands on the lower part of the side slopes.

Typically, the surface layer is dark grayish brown and brown, friable loam about 6 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is yellowish brown, friable clay loam, and the lower part is yellowish brown, mottled, firm clay loam.

Permeability is moderately slow, and runoff is very rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are used as woodland or pasture. Many support native hardwoods. This soil is unsuited to cultivated crops and is poorly suited to hay and pasture because of the slope and a severe hazard of erosion.

A cover of pasture plants helps to control erosion; however, production may be low. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIIe.

83B—Kenyon loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on ridgetops in the uplands. Areas range from 5 to 20 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, friable loam about 8 inches thick. The subsurface layer is very dark grayish brown and dark brown, friable loam about 10 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is brown, friable loam, and the lower part is mottled yellowish brown, firm loam. In places the surface layer is sandy loam.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is about 3 to 4 percent. The subsoil has a very low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and

legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface helps to prevent excessive soil loss. In most places contour farming and terracing also help to control erosion. Fieldwork is slightly delayed in wet years. Applying adequate erosion-control and drainage measures is difficult. As a result, a combination of terraces and a tile drainage system is needed in places. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to maintain good tilth.

A cover of pasture plants or hay helps to control erosion. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIe.

83C2—Kenyon loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on short side slopes in the uplands. Areas range from 3 to 20 acres in size. They are elongated and irregularly shaped.

Typically, the surface layer is very dark grayish brown and brown loam about 7 inches thick. It is mixed with streaks and pockets of material from the subsoil. The subsoil is about 35 inches thick. The upper part is dark yellowish brown, friable loam, and the lower part is mottled, yellowish brown, firm loam. The substratum to a depth of about 60 inches is mottled yellowish brown and light brownish gray loam.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil has a very low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is moderately suited to corn and soybeans and is well suited to small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. Terraces and a system of conservation tillage that leaves crop residue on the surface help to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. If terraces are built, cuts should not expose the less productive underlying glacial till. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration. More nitrogen generally is needed on this soil than on Kenyon soils that are not so eroded. Also, more intensive management is needed to maintain productivity and tilth.

A cover of pasture plants or hay helps to control erosion. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIIe.

83D2—Kenyon loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained soil is on short side slopes in the uplands. Areas range from 3 to 20 acres in size. They are elongated and irregularly shaped.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. It is mixed with streaks and pockets of material from the subsoil. The subsoil is about 32 inches thick. The upper part is dark yellowish brown, friable loam, and the lower part is mottled, yellowish brown, firm loam. The substratum to a depth of about 60 inches is mottled yellowish brown and light brownish gray loam.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil has a very low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is moderately suited to corn and soybeans and is well suited to small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. Terraces and a system of conservation tillage that leaves crop residue on the surface help to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. If terraces are built, cuts should not expose the less productive underlying glacial till. Tilth generally is fair in the surface layer. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration. More nitrogen generally is needed on this soil than on Kenyon soils that are not so eroded. Also, more intensive management is needed to maintain productivity and tilth.

A cover of pasture plants or hay helps to control erosion. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIIe.

83D3—Kenyon loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, moderately well drained soil is on short side slopes in the uplands.

Areas range from 3 to 25 acres in size and are irregularly shaped.

Typically, the surface layer is mixed dark yellowish brown and brown, friable loam about 8 inches thick. The subsoil is about 34 inches thick. The upper part is dark yellowish brown, friable loam, and the lower part is yellowish brown, mottled, firm loam. The substratum to a depth of about 60 inches is mottled yellowish brown and light brownish gray loam.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 1 to 2 percent. The subsoil has a very low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is poorly suited to corn and soybeans and is moderately suited to small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a severe hazard. Terraces and a system of conservation tillage that leaves crop residue on the surface help to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. If terraces are built, cuts should not expose the less productive underlying glacial till. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration. More nitrogen generally is needed on this soil than on Kenyon soils that are not so eroded. Also, more intensive management is needed to maintain productivity and improve tilth.

A cover of pasture plants or hay helps to control erosion. Reseeding may be difficult because the organic matter content is lower in this soil than in the less eroded Kenyon soils. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IVe.

84—Clyde clay loam, 0 to 3 percent slopes. This nearly level and very gently sloping, poorly drained soil is in the lower, concave landscape positions and in upland drainageways. Areas range from 10 to 50 acres in size and are irregularly shaped.

Typically, the surface layer is black, friable clay loam about 8 inches thick. The subsurface layer is black and very dark gray, firm clay loam about 14 inches thick. The subsoil is about 30 inches thick. The upper part is very dark gray, mottled, firm clay loam, and the lower part is dark gray, mottled, friable loam, clay loam, and sandy loam. The substratum to a depth of about 60 inches is mottled grayish brown and yellowish brown loam.

Included with this soil in mapping are areas of soils that are not as gray in the subsoil as the Clyde soil or as wet. These soils are in bands that adjoin better drained soils. They make up 10 to 15 percent of the unit.

Permeability of this Clyde soil is moderate, and runoff is slow. Available water capacity is high. The seasonal high water table is at a depth of 1.0 to 2.5 feet. The content of organic matter is about 6 to 9 percent in the surface layer. The subsoil generally has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. A drainage system is needed to lower the seasonal high water table. It improves the timeliness of fieldwork and provides aeration and a deep root zone for plants. Gullying is a hazard in areas where runoff concentrates. Grassed waterways help to prevent gully erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

If this soil is pastured, overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth, increases the runoff rate, and damages the plant cover. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. In order to achieve the best results, grasses and legumes selected for planting should be those that are able to tolerate the high water table.

The land capability classification is IIw.

118—Garwin silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on concave slopes at the head of drainageways and on upland ridgetops. Areas range from 10 to 100 acres in size and are irregularly shaped.

Typically, the surface layer is black, friable silty clay loam about 9 inches thick. The subsurface layer also is black, friable silty clay loam about 9 inches thick. The subsoil to a depth of about 60 inches is dark gray, grayish brown, and light brownish gray, mottled, friable silty clay loam. In places sand is at a depth of 4 to 8 feet.

Included with this soil in mapping are areas of the somewhat poorly drained Muscatine soils. These soils are in the higher, convex landscape positions. They make up about 2 to 5 percent of the unit.

Permeability of this Garwin soil is moderate, and runoff is slow. Available water capacity is high. The

seasonal high water table is at a depth of 1 to 2 feet. The content of organic matter in the surface layer is 6 to 7 percent. The surface layer generally has a very low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. It is suited to intensively grown row crops, but a drainage system is needed for optimum crop production. It lowers the water table, improves the timeliness of fieldwork, and provides aeration and a deep root zone for plants. A system of conservation tillage that leaves crop residue on the surface helps to control soil blowing. Returning crop residue to the surface or regularly adding other organic material improves fertility and helps to maintain tilth.

A cover of pasture plants or hay helps to control soil blowing. Forage production is limited to those crop mixtures that are tolerant of the wetness. An example of such a mixture is birdsfoot trefoil and orchardgrass or red clover and timothy. Restricting grazing and equipment use during wet periods minimizes compaction and thus helps to maintain tilth and productivity. Pasture rotation is beneficial.

The land capability classification is IIw.

119—Muscatine silty clay loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on broad ridgetops in the uplands. Areas range from 10 to 100 acres in size and are irregularly shaped.

Typically, the surface layer is black, friable silty clay loam about 10 inches thick. The subsurface layer is very dark brown, friable silty clay loam about 5 inches thick. The subsoil is mottled, friable silty clay loam about 39 inches thick. The upper part is dark grayish brown, and the lower part is grayish brown. The substratum to a depth of about 60 inches is grayish brown, mottled silt loam. In some places the surface layer is lighter in color and has a lower content of organic matter. In other places sand is at a depth of 4 to 8 feet.

Included with this soil in mapping are small areas of the poorly drained Garwin soils. Garwin soils are in the flatter areas. Also included are small areas of soils that are subject to erosion and are more sloping than the Muscatine soil. Included soils make up 5 to 10 percent of the unit.

Permeability of this Muscatine soil is moderate, and runoff is slow. Available water capacity is high. The seasonal high water table is at a depth of 2 to 4 feet. The content of organic matter in the surface layer is 5 to 6 percent. The surface layer generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture (fig. 7). Soil blowing is a hazard in intensively cultivated areas. A system of conservation tillage that leaves crop residue on the surface helps to control soil blowing. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to maintain tilth. A tile drainage system may be needed.

A cover of pasture plants or hay helps to control soil blowing. This soil has only slight limitations affecting the selection of productive forage species. Restricting grazing and equipment use during wet periods minimizes compaction of the soil and damage to the vegetation and thus helps to maintain tilth and productivity.

The land capability classification is I.

119B—Muscatine silty clay loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on broad ridgetops in the uplands. Areas range from 10 to 100 acres in size and are irregularly shaped.

Typically, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer is very dark brown silty clay loam about 5 inches thick. The subsoil is dark grayish brown, mottled, friable silty clay loam about 39 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled silty clay loam. In some places the surface layer is lighter in color, has a lower content of organic matter, and is thinner. In other places sand is within a depth of 8 feet.

Included with this soil in mapping are small areas of the poorly drained Garwin soils. Garwin soils are in the flatter areas. Also included are small areas of soils that are subject to erosion and are more sloping than the Muscatine soil. Included soils make up 5 to 10 percent of the unit.

Permeability of this Muscatine soil is moderate, and runoff is medium. Available water capacity is high. The seasonal high water table is at a depth of 2 to 4 feet. The content of organic matter in the surface layer is 4 to 5 percent. The surface layer generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Erosion is a hazard in cultivated areas. The soil is subject to overwash from soils upslope and may be wet or seepy during periods of heavy rainfall. Terracing or contour farming in areas of this soil and the soils upslope helps to control erosion. Installing drainage tile improves the timeliness of fieldwork. A system of conservation tillage that leaves crop residue on the surface helps to prevent excessive soil loss. Returning crop residue to the soil or regularly

Figure 7.—Soybeans in an area of Muscatine silty clay loam, 0 to 2 percent slopes. A residential area is in the background.

adding other organic material improves fertility and helps to maintain tilth.

A cover of pasture plants or hay helps to control water erosion and soil blowing. This soil has only slight limitations affecting the selection of productive forage species. Restricting grazing and equipment use during wet periods minimizes compaction of the soil and damage to the vegetation and thus helps to maintain tilth and productivity.

The land capability classification is IIe.

120B—Tama silty clay loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on broad, convex ridges in the uplands. Areas range from 20 to more than 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, friable silty clay loam about 8 inches thick. The subsurface layer is very dark brown and very dark grayish brown, friable silty clay loam about 11 inches thick. The subsoil to a depth of about 60 inches is friable silty clay loam. The upper part is brown, and the lower part is brown and yellowish brown and is mottled. In places the surface layer is dark brown and very dark grayish brown.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 3 to 4 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to

corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. It can be controlled, however, by contour farming, a system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping. In most areas slopes are long enough and uniform enough for terracing. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

The land capability classification is IIe.

120B2—Tama silty clay loam, 2 to 5 percent slopes, moderately eroded. This gently sloping, well drained soil is on broad, convex ridges in the uplands. Areas range from 20 to more than 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, friable silty clay loam about 7 inches thick. It is mixed with streaks and pockets of material from the subsoil. The subsoil is friable and mottled. The upper part is brown silty clay loam, and the lower part to a depth of about 60 inches is brown and dark grayish brown silt loam. In places the surface layer is dark brown and very dark grayish brown silty clay loam about 8 inches thick.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. It can be controlled, however, by contour farming, a system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping. Good tilth generally can be easily maintained. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the tilth and fertility of the soil.

The land capability classification is IIe.

120C—Tama silty clay loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on convex side slopes in the uplands. Areas range from 5 to 20 acres in size and are elongated.

Typically, the surface layer is very dark brown, friable silty clay loam about 8 inches thick. The subsurface layer is very dark brown, friable silt loam about 9 inches thick. The subsoil is friable silty clay loam about 36 inches thick. The upper part is brown and dark yellowish brown, the next part is dark yellowish brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown silt loam that has grayish brown mottles.

Included with this soil in mapping are small areas of moderately eroded soils. These soils are in landscape positions similar to those of the Tama soil. They are lower in content of organic matter and fertility than the Tama soil and have a thinner surface layer. They make up less than 10 percent of the unit.

Permeability of this Tama soil is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 3 to 4 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. It can be controlled, however, by contour farming, a system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping. Slopes generally are long enough and uniform enough for terracing (fig. 8). Grassed waterways help to prevent the formation of gullies. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIIe.

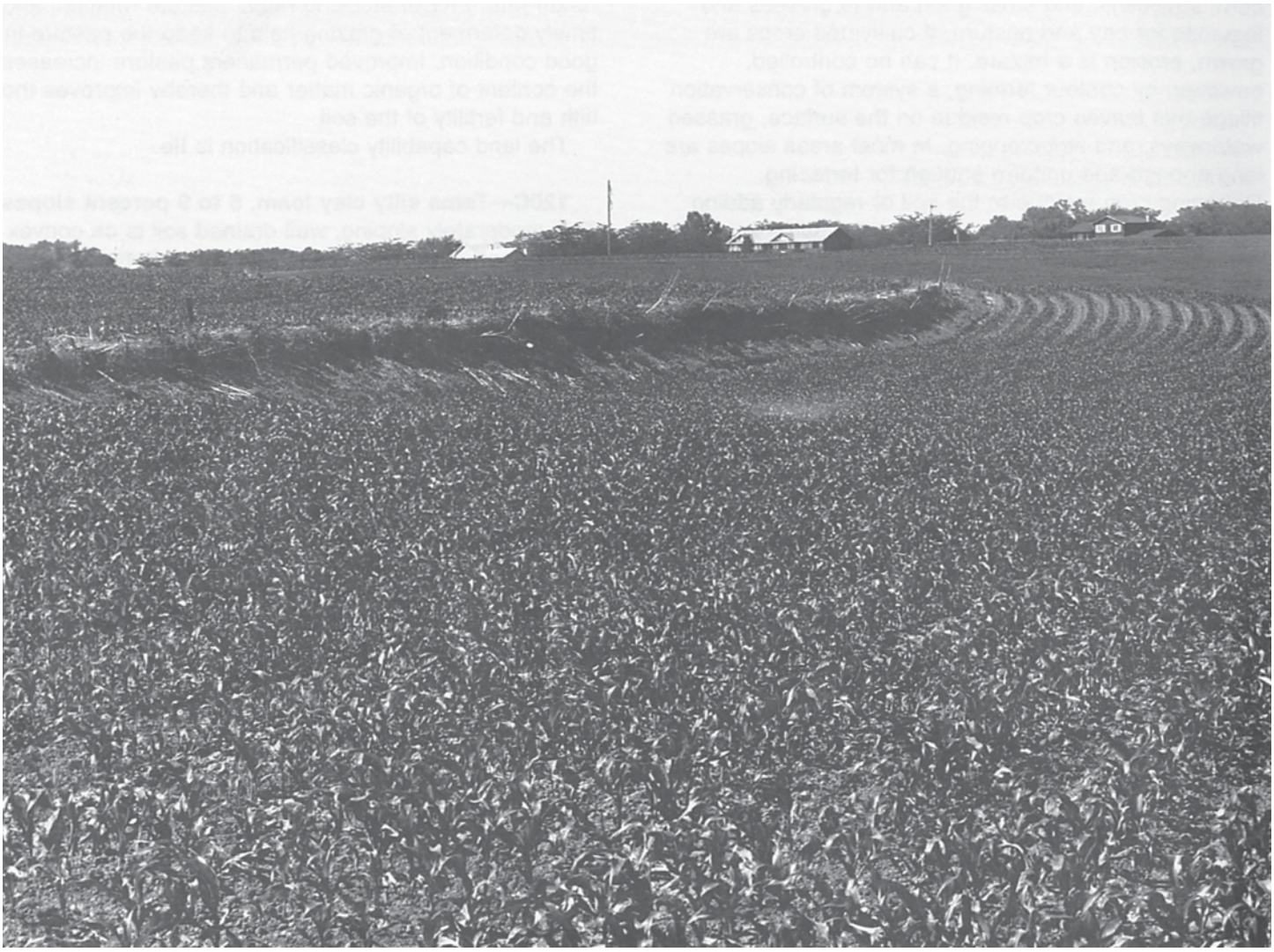

Figure 8.—Terraces help to control erosion in this cultivated area of Tama silty clay loam, 5 to 9 percent slopes.

120C2—Tama silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is on convex side slopes in the uplands. Areas range from 10 to 40 acres in size and are elongated.

Typically, the surface layer is very dark brown, friable silty clay loam about 7 inches thick. It is mixed with streaks and pockets of brown material from the subsoil. The subsoil is friable silty clay loam about 38 inches thick. The upper part is brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn and soybeans and is well suited to small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. It can be controlled, however, by contour farming, a system of conservation tillage that leaves crop residue on the surface, grassed waterways, terraces, and stripcropping. Slopes generally are long enough and uniform enough for terracing. Grassed waterways help to prevent the formation of gullies. More intense management and more nitrogen are needed on this soil than on the less eroded Tama soils to maintain productivity and improve tilth. Returning crop residue to

the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Most forage crops grow well on this soil. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the quality of the stand and the fertility of the soil.

The land capability classification is IIIe.

120C3—Tama silty clay loam, 5 to 9 percent slopes, severely eroded. This moderately sloping, well drained soil is on convex side slopes in the uplands. Areas range from 10 to 40 acres in size and are elongated.

Typically, the surface layer is brown, friable silty clay loam about 6 inches thick. It is mixed with streaks and pockets of very dark brown material from the original surface layer. The subsoil is friable silty clay loam about 36 inches thick. The upper part is brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 1 to 2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a severe hazard. It can be controlled, however, by contour farming, a system of conservation tillage that leaves crop residue on the surface, grassed waterways, terraces, and stripcropping. Slopes generally are long enough and uniform enough for terracing. Grassed waterways help to prevent the formation of gullies. More intense management and more nitrogen are needed on this soil than on the less eroded Tama soils to maintain productivity and improve tilth. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Most forage crops grow well on this soil. Reseeding may be difficult because the organic matter content is lower in this soil than in the less eroded Tama soils. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the tilth and fertility of the soil.

The land capability classification is IVe.

120D2—Tama silty clay loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is on convex side slopes in the uplands. Areas range from 10 to 40 acres in size and are elongated.

Typically, the surface layer is very dark brown, friable silty clay loam about 7 inches thick. It is mixed with streaks and pockets of brown material from the subsoil. The subsoil is friable silty clay loam about 36 inches thick. The upper part is brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places sand, loamy sand, or sandy loam is at a depth of 4 to 8 feet.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. It can be controlled, however, by contour farming, a system of conservation tillage that leaves crop residue on the surface, grassed waterways, terraces, and stripcropping (fig. 9). Slopes generally are long enough and uniform enough for terracing. Grassed waterways help to prevent the formation of gullies. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration. More intense management and more nitrogen are needed on this soil than on the less eroded Tama soils to maintain productivity and improve tilth.

A cover of pasture plants or hay helps to control erosion. Most forage crops grow well on this soil. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of

Figure 9.—A grassed waterway in an area of Tama silty clay loam, 9 to 14 percent slopes, moderately eroded, reduces the rate of runoff.

organic matter and thereby improves the tilth and fertility of the soil.

The land capability classification is IIIe.

120D3—Tama silty clay loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, well drained soil is on convex side slopes in the uplands. Areas range from 10 to 40 acres in size and are elongated.

Typically, the surface layer is brown, friable silty clay loam about 6 inches thick. About 10 to 15 percent of the surface layer is streaks and pockets of dark brown material from the original surface layer. The subsoil is friable silty clay loam about 31 inches thick. The upper part is brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places sand, loamy sand, or sandy loam is at a depth of 4 to 8 feet.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 1 to 2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a severe hazard. It can be controlled, however, by contour farming, a system of conservation tillage that leaves crop residue on the surface, grassed waterways, terraces, and stripcropping. Slopes generally are long enough and uniform enough for terracing. Grassed waterways help

to prevent the formation of gullies. More intense management and more nitrogen are needed on this soil than on the less eroded Tama soils to maintain productivity and improve tilth. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Most forage crops grow well on this soil. Reseeding may be difficult because the organic matter content is lower in this soil than in the less eroded Tama soils. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the tilth and fertility of the soil.

The land capability classification is IVe.

120E2—Tama silty clay loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is on convex side slopes in the uplands. Areas range from 10 to 25 acres in size and are elongated.

Typically, the surface layer is very dark brown, friable silty clay loam about 7 inches thick. It is mixed with streaks and pockets of brown material from the subsoil. The subsoil is friable silty clay loam about 36 inches thick. The upper part is brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places sand, loamy sand, or sandy loam is at a depth of 4 to 8 feet.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. Some are pastured. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. It can be controlled, however, by contour farming, a system of conservation tillage that leaves crop residue on the surface, grassed waterways, terraces, stripcropping, and a cropping sequence that includes grasses and legumes. Slopes generally are long enough and uniform enough for terracing. Grassed waterways help to prevent the formation of gullies. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration. More intense management and more nitrogen are needed on this soil than on the less eroded Tama soils to maintain productivity and improve tilth.

A cover of pasture plants or hay helps to control erosion. Most forage crops grow well on this soil. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate and the hazard of erosion. Gullying is a severe hazard along livestock trails. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the tilth and fertility of the soil.

The land capability classification is IVe.

120E3—Tama silty clay loam, 14 to 18 percent slopes, severely eroded. This moderately steep, well drained soil is on convex side slopes in the uplands. Areas range from 10 to 25 acres in size and are elongated.

Typically, the surface layer is brown, friable silty clay loam about 6 inches thick. About 10 to 15 percent of the surface layer is streaks and pockets of dark brown material from the original surface layer. The subsoil is friable silty clay loam about 32 inches thick. The upper part is brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places sand, loamy sand, or sandy loam is at a depth of 4 to 8 feet.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 1 to 2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is unsuited to cultivated crops and is only moderately suited to small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a serious hazard. It can be reduced, however, by contour farming, a system of conservation tillage that leaves crop residue on the surface, grassed waterways, terraces, and stripcropping. Slopes generally are long enough and uniform enough for terracing. Grassed waterways help to prevent the formation of gullies. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration. More intense management and more nitrogen are needed on this soil than on the less eroded Tama soils to maintain productivity and improve tilth.

A cover of pasture plants or hay helps to control erosion. Most forage crops grow well on this soil. Reseeding may be difficult because the organic matter

content is lower in this soil than in the less eroded Tama soils. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIe.

133—Colo silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is at the lower elevations on flood plains. It is occasionally flooded. Areas generally range from 5 to 100 acres in size, but some are as large as 300 acres. The areas are irregularly shaped.

Typically, the surface layer is black, friable silty clay loam about 11 inches thick. The subsurface layer is black, friable silty clay loam about 20 inches thick. The subsoil to a depth of about 60 inches is friable, mottled silty clay loam. The upper part is very dark gray and dark gray, and the lower part is grayish brown. In places about 12 to 20 inches of recently deposited silt loam overlies the surface layer.

Included with this soil in mapping are small areas of the somewhat poorly drained Ely soils. These soils are slightly higher on the landscape than the Colo soil. They can be tilled more easily than the Colo soil and dry out more rapidly after rains. They make up less than 10 percent of the unit.

Permeability of this Colo soil is moderate, and runoff is slow. The seasonal high water table is at a depth of 1 to 3 feet. Available water capacity is high. The content of organic matter in the surface layer is 5 to 7 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. A drainage system is needed to reduce the wetness and provide good aeration and a deep root zone for plants. Tile drains work well if they are properly installed and if an adequate outlet is available. Tilth generally is fair in the surface layer. Returning crop residue to the soil or regularly adding other organic material and deferring tillage when the soil is wet improve tilth and fertility, help to prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay helps to control soil blowing. Unless the soil is drained, forage production is limited to those crop mixtures that are tolerant of the wetness. An example of such a mixture is birdsfoot trefoil and tall fescue or red clover and timothy. Restricting grazing and equipment use during wet periods minimizes compaction and thus helps to maintain tilth and productivity. Pasture rotation is beneficial.

The land capability classification is IIw.

139—Perks sand, 0 to 3 percent slopes. This nearly level, excessively drained soil is on flood plains. It is occasionally flooded. Areas range from 10 to 100 acres in size and are irregularly shaped.

Typically, the surface layer is dark brown, very friable sand about 4 inches thick. The substratum to a depth of about 60 inches is stratified dark yellowish brown and yellowish brown sand. In places the surface layer is loamy sand.

Included with this soil in mapping are areas of the somewhat poorly drained Shaffton soils in the lower areas. These soils have a stratified substratum. They make up about 10 percent of the unit.

Permeability of this Perks soil is rapid, and runoff is slow. Available water capacity is very low. The content of organic matter in the surface layer is 1 to 2 percent. The surface layer generally has a very low supply of available phosphorus and potassium.

Most areas are wooded. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, soil blowing is a severe hazard. The soil is very droughty unless rainfall is above normal and timely. Conservation practices that leave crop residue on the surface help to control soil blowing and conserve soil moisture. Returning crop residue to the surface or regularly adding other organic material improves soil fertility.

A cover of pasture plants or hay helps to control soil blowing; however, production may be low. Species that can withstand the droughtiness should be selected for planting. Examples of such species are alfalfa, smooth brome, and crownvetch. Managing the pasture and hayland is difficult because of the flooding and the droughtiness. Production of forage for hay and pasture may be limited during hot, dry periods because the water-holding capacity in the substratum is very low unless rainfall is above normal and timely. Restricting grazing and equipment use during dry periods helps to prevent overgrazing and damage to the vegetative cover and thus helps to control soil blowing. Pasture rotation is beneficial.

The land capability classification is IVs.

151—Marshan clay loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes. This nearly level, poorly drained soil is on stream terraces. Areas range from 10 to more than 160 acres in size and are irregularly shaped.

Typically, the surface layer is black, friable clay loam about 9 inches thick. The subsurface layer is very dark gray, friable loam about 7 inches thick. The subsoil is about 12 inches thick. The upper part is dark gray, friable loam, and the lower part is dark gray, very friable sandy loam. The substratum to a depth of about 60 inches is grayish brown coarse sand. In places the subsoil extends to a depth of about 36 inches.

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

Permeability of this Marshan soil is moderate in the subsoil and very rapid in the substratum. Runoff is slow. Available water capacity is moderate. The seasonal high water table is at a depth of 0.5 foot to 2.5 feet. The content of organic matter in the surface layer is 5 to 6 percent. The subsoil has a very low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is well suited to intensive cropping of corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If row crops are grown, a drainage system is needed to lower the water table and improve the timeliness of fieldwork. Measures that help to control runoff from the higher elevations also are needed. Establishing adequate drainage outlets and installing drainage tile are difficult in some areas because of the loose, water-bearing sand and gravel. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control soil blowing. Unless the soil is drained, forage production is limited to those crop mixtures that are tolerant of the wetness. An example of such a mixture is birdsfoot trefoil and tall fescue or red clover and timothy. Restricting grazing and equipment use during wet periods minimizes compaction of the soil and damage to the vegetation and thus helps to maintain tilth and productivity. Pasture rotation is beneficial.

The land capability classification is IIw.

160—Walford silt loam, 0 to 2 percent slopes. This nearly level, very poorly drained and poorly drained soil is in flat or depressed areas in the uplands. Areas range from 3 to 20 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, friable silt loam about 9 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 4 inches thick. The subsoil to a depth of about 60 inches is mottled, friable silty clay loam. The upper part is grayish brown, and the lower part is light brownish gray. In places sand is within a depth of 8 feet.

Permeability is moderately slow, and runoff is slow. Available water capacity is high. The seasonal high water table is within a depth of 2 feet. The content of organic matter in the surface layer is 2.5 to 3.5 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. It has a high water table and is ponded in some areas for short periods of time (fig. 10). It tends to puddle if worked when it is wet. Tile drains generally work satisfactorily if suitable outlets are available, but a surface drainage system also is needed in some areas. In places tillage has mixed part of the subsurface layer into the plow layer. As a result, a hard crust forms after periods of heavy rainfall. Seedling development is retarded if crusting occurs prior to emergence of the seedling. Returning crop residue to the surface or regularly adding other organic material improves fertility, helps to maintain tilth, minimizes crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control soil blowing. Forage production is limited to those crop mixtures that are tolerant of the wetness. An example of such a mixture is birdsfoot trefoil and orchardgrass or red clover and timothy. Restricting grazing and equipment use during wet periods minimizes compaction of the soil and damage to the vegetation and thus helps to maintain tilth and productivity. Pasture rotation is beneficial.

The land capability classification is IIIw.

162B—Downs silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on narrow ridges in the uplands. Areas range from 10 to 80 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsoil is friable silty clay loam about 45 inches thick. The upper part is dark yellowish brown, the next part is yellowish brown and brown and is mottled, and the lower part is mottled brown and grayish brown. The substratum to a depth of about 60 inches is mottled brown and grayish brown silty clay loam.

Included with this soil in mapping are small areas of Tama soils along ridges at the head of drainageways. These soils have a surface layer that is darker, thicker, and higher in content of organic matter than that of the Downs soil. They make up less than 10 percent of the unit.

Permeability of this Downs soil is moderate, and

Figure 10.—A ponded area of Walford silt loam, 0 to 2 percent slopes.

runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 2.5 to 3.5 percent. The subsoil generally has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture (fig. 11). If cultivated crops are grown, erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, contour farming, and stripcropping help to prevent excessive soil loss. Slopes generally are long enough and uniform enough for terracing and contour farming. Good tilth generally can be easily maintained. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIe.

162C2—Downs silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is on narrow ridges and long, convex side slopes in the uplands. Areas range from 10 to more than 60 acres in size and are irregularly shaped.

Typically, the surface layer is mixed very dark grayish brown and brown, friable silt loam about 8 inches thick. It is also mixed with streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is about 44 inches thick. It is friable. The upper part is dark yellowish brown silt loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has strong brown and grayish brown mottles. In some places the surface layer is brown silty clay loam. In other places it is very dark brown silt loam.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard.

Figure 11.—An area of Downs silt loam, 2 to 5 percent slopes, used for hay.

A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping help to prevent excessive soil loss. Slopes commonly are long enough and uniform enough for terracing and contour farming. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage species. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the quality of the stand and the fertility of the soil.

The land capability classification is IIIe.

162C3—Downs silty clay loam, 5 to 9 percent slopes, severely eroded. This moderately sloping, well drained soil is on narrow ridges and convex side slopes in the uplands. Areas range from 5 to more than 50 acres in size and are irregularly shaped.

Typically, the surface layer is brown, friable silty clay loam about 8 inches thick. It is mixed with streaks and pockets of dark brown material from the original surface layer. The subsoil is friable silty clay loam about 43 inches thick. The upper part is dark brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places sand, loamy sand, or sandy loam is at a depth of 4 to 8 feet.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 1 to 2 percent. The subsoil generally has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and a cropping sequence that includes grasses and legumes help to prevent excessive soil loss. Slopes commonly are long enough and uniform enough for terracing and contour farming. More intense management and more nitrogen are needed on this soil than on the less eroded Downs soils to maintain productivity and improve tilth. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Reseeding may be difficult because the organic matter content is lower in this soil than in the less eroded Downs soils. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the quality of the stand and the fertility of the soil.

The land capability classification is IVe.

162D2—Downs silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is on long, convex side slopes in the uplands. Areas range from 10 to 30 acres in size and are elongated.

Typically, the surface layer is very dark grayish brown and brown, friable silt loam about 8 inches thick. It is mixed with streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is about 38 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has grayish brown and strong brown mottles. In places the surface layer is brown silty clay loam.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping help to prevent excessive soil loss. Slopes commonly are long enough and uniform enough for terracing and contour farming. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage species. Overgrazing or grazing when the soil is too wet causes

surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the quality of the stand and the fertility of the soil.

The land capability classification is IIIe.

162D3—Downs silty clay loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, well drained soil is on convex side slopes in the uplands. Areas range from 5 to 40 acres in size and are elongated.

Typically, the surface layer is brown, friable silty clay loam about 8 inches thick. It is mixed with streaks and pockets of material from the original surface layer. The subsoil is friable silty clay loam about 38 inches thick. The upper part is dark brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places loamy sand or sandy loam is at a depth of 4 to 8 feet.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 1 to 2 percent. The subsoil generally has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a severe hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and a cropping sequence that includes grasses and legumes help to prevent excessive soil loss. Slopes commonly are long enough and uniform enough for terracing and contour farming. More intense management is needed on this soil than on the less eroded Downs soils to maintain productivity and improve tilth. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Reseeding may be difficult because the organic matter content is lower in this soil than in the less eroded Downs soils. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IVe.

162E2—Downs silt loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is on short, convex side slopes in the uplands. Areas range from 5 to 15 acres in size and are elongated.

Typically, the surface layer is very dark grayish brown and brown, friable silt loam about 8 inches thick. It is mixed with streaks and pockets of yellowish brown material from the subsoil. The subsoil is about 36 inches thick. It is yellowish brown and friable. The upper part is silty clay loam, and the lower part is silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has grayish brown and strong brown mottles. In places the surface layer is brown silty clay loam.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. A few are pastured. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping help to prevent excessive soil loss. Slopes generally are too short and too steep for terracing. In some areas, however, the soil can be terraced along with the less sloping soils upslope. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet. More intense management is needed on this soil than on the noneroded Downs soils to maintain productivity. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Gullying is a severe hazard along livestock trails. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the quality of the stand and the fertility of the soil.

The land capability classification is IVe.

162E3—Downs silty clay loam, 14 to 18 percent slopes, severely eroded. This moderately steep, well drained soil is on short, convex side slopes in the

uplands. Areas range from 5 to 15 acres in size and are elongated.

Typically, the surface layer is brown, friable silty clay loam about 8 inches thick. About 10 to 15 percent of the surface layer is streaks and pockets of dark grayish brown material from the original surface layer. The subsoil is about 32 inches thick. It is yellowish brown and friable. The upper part is silty clay loam, and the lower part is silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has grayish brown and strong brown mottles.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 1 to 2 percent. The subsoil generally has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. A few are pastured. This soil is unsuited to cultivated crops. It is moderately suited to small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a severe hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, contour farming, and stripcropping help to reduce excessive soil loss. Slopes generally are too short and too steep for terracing. In some areas, however, this soil can be terraced along with the less sloping soils upslope. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration. More intense management and more nitrogen are needed on this soil than on the less eroded Downs soils to maintain productivity and improve tilth.

A cover of pasture plants or hay helps to control erosion. Reseeding may be difficult because the organic matter content is lower in this soil than in the less eroded Downs soils. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIe.

162F2—Downs silt loam, 18 to 25 percent slopes, moderately eroded. This steep, well drained soil is on short, convex side slopes in the uplands. Areas range from 5 to 15 acres in size and are elongated.

Typically, the surface layer is very dark grayish brown and brown, friable silt loam about 8 inches thick. It is mixed with streaks and pockets of yellowish brown material from the subsoil. The subsoil is about 32 inches thick. It is yellowish brown and friable. The upper part is silty clay loam, and the lower part is silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has grayish brown and strong brown mottles. In places the surface layer is brown silty clay loam.

Permeability is moderate, and runoff is very rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. Many are pastured. This soil is unsuited to row crops because of the slope and a severe hazard of erosion. It is moderately suited to grasses and legumes for hay and pasture. Slopes generally are too short and too steep for terracing. Operating farm machinery is difficult because of the slope and because of gullies and waterways. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion; however, production may be low. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIe.

163B2—Fayette silt loam, 2 to 5 percent slopes, moderately eroded. This gently sloping, well drained soil is on convex, moderately wide ridgetops in the uplands. Areas range from 10 to 80 acres in size and are irregularly shaped.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. It is mixed with streaks and pockets of dark yellowish brown silty clay loam from the subsoil. The subsoil is friable silty clay loam about 49 inches thick. The upper part is dark yellowish brown, the next part is yellowish brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is yellowish brown and grayish brown, mottled silty clay loam.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 1.5 to 2.5 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated. This soil is well suited to

corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping help to prevent excessive soil loss. Slopes commonly are long enough and uniform enough for terracing and contour farming. Tilth generally is fair in the surface layer. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the quality of the stand and the fertility of the soil.

The land capability classification is IIe.

163C—Fayette silt loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on narrow ridges and long, convex side slopes in the uplands. Areas range from 10 to 50 acres in size and are irregularly shaped.

Typically, the surface layer is very dark gray, friable silt loam about 3 inches thick. The subsurface layer is grayish brown, friable silt loam about 8 inches thick. The subsoil is about 39 inches thick. It is friable. The upper part is brown silt loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown and grayish brown, mottled silty clay loam. In places the surface layer is dark grayish brown silt loam about 7 inches thick.

Included with this soil in mapping are small areas of moderately eroded soils on convex side slopes. These soils have a lower content of organic matter and poorer tilth than the Fayette soil. They make up less than 5 percent of the unit.

Permeability of this Fayette soil is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated. Many are used as woodland or permanent pasture. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping help to prevent excessive soil loss. Slopes are long enough and uniform enough for terracing and contour farming. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIIe.

163C2—Fayette silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is on narrow ridges and long, convex side slopes in the uplands. Areas range from 20 to 80 acres in size and are irregularly shaped.

Typically, the surface layer is dark grayish brown and brown silt loam about 8 inches thick. It is mixed with streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is about 35 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown and grayish brown, mottled silty clay loam. In places the surface layer is brown silty clay loam.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 1.5 to 2.5 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping help to prevent excessive soil loss. Slopes commonly are long enough and uniform enough for terracing and contour farming. More intense management is needed on this soil than on the noneroded Fayette soils to maintain productivity. If this soil is cultivated, the surface layer tends to crust after

hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the tilth and fertility of the soil.

The land capability classification is IIIe.

163C3—Fayette silty clay loam, 5 to 9 percent slopes, severely eroded. This moderately sloping, well drained soil is on narrow ridges and convex side slopes in the uplands. Areas range from 5 to more than 40 acres in size and are irregularly shaped.

Typically, the surface layer is brown, friable silty clay loam about 8 inches thick. It is mixed with streaks and pockets of dark brown material from the original surface layer. The subsoil to a depth of about 60 inches is friable silty clay loam. The upper part is dark yellowish brown and yellowish brown, and the lower part is yellowish brown and mottled.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 0.5 to 2.0 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a severe hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, stripcropping, and a cropping sequence that includes grasses and legumes help to prevent excessive soil loss. Slopes commonly are long enough and uniform enough for terracing and contour farming. More intense management is needed on this soil than on the less eroded Fayette soils to maintain productivity and improve tilth. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Most forage crops are suited to this soil. Reseeding may be difficult because the organic matter content is lower in this soil than in the less eroded Fayette soils. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the tilth and fertility of the soil.

The land capability classification is IVe.

163D—Fayette silt loam, 9 to 14 percent slopes. This strongly sloping, well drained soil is on long, convex side slopes in the uplands. Areas range from 10 to 25 acres in size and are elongated.

Typically, the surface layer is very dark gray, friable silt loam about 3 inches thick. The subsurface layer is dark gray and dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 36 inches thick. It is friable. The upper part is brown silty clay loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has grayish brown mottles. In places the surface layer is dark grayish brown silt loam about 7 inches thick.

Included with this soil in mapping are small areas of Lindley soils on the lower part of side slopes. These soils contain more sand than the Fayette soil. They make up less than 5 percent of the unit.

Permeability of this Fayette soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a low supply of potassium.

Most areas are used as woodland or permanent pasture. A few have been cleared of trees and are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping help to prevent excessive soil loss. Slopes commonly are long enough and uniform enough for terracing and contour farming. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet. Tilth generally is fair in the surface layer. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation,

timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIIe.

163D2—Fayette silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is on narrow ridges and on convex side slopes in the uplands. Areas range from 10 to 40 acres in size and are elongated.

Typically, the surface layer is dark grayish brown and brown, friable silt loam about 8 inches thick. It is mixed with streaks and pockets of dark yellowish brown silty clay loam from the subsoil. The subsoil is about 35 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has grayish brown mottles.

Included with this soil in mapping are small areas of severely eroded Fayette soils on convex side slopes. These soils have a lower content of organic matter than the moderately eroded Fayette soil. They also have poorer tilth. They make up less than 10 percent of the unit.

Permeability of this Fayette soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 1.5 to 2.5 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated. A few are pastured. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, contour stripcropping, and grassed waterways help to prevent excessive soil loss. Slopes commonly are long enough and uniform enough for terracing and contour farming. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the tilth and fertility of the soil. Pasture rotation is beneficial.

The land capability classification is IIIe.

163D3—Fayette silty clay loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, well drained soil is on short, convex side slopes in the uplands. Areas range from 10 to 30 acres in size and are elongated.

Typically, the surface layer is brown, friable silty clay loam about 8 inches thick. About 10 to 15 percent of the surface layer is streaks and pockets of dark brown silt loam from the original surface layer. The subsoil is about 32 inches thick. It is yellowish brown and friable. The upper part is silty clay loam, and the lower part is silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has grayish brown mottles. In places the surface layer is dark grayish brown and brown silt loam.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 0.5 to 1.5 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. It is best suited to hay and pasture. If cultivated crops are grown, further erosion is a severe hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping help to prevent excessive soil loss. In a few areas slopes are long enough and uniform enough for contour farming. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration. More nitrogen generally is needed on this soil than on the less eroded Fayette soils. Also, more intense management is needed to maintain productivity and improve tilth.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Reseeding may be difficult because the organic matter content is lower in this soil than in the less eroded Fayette soils. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the tilth and fertility of the soil.

The land capability classification is IVe.

163E—Fayette silt loam, 14 to 18 percent slopes. This moderately steep, well drained soil is on long, convex side slopes in the uplands. Areas range from 10 to 20 acres in size and are elongated.

Typically, the surface layer is very dark gray, friable silt loam about 3 inches thick. The subsurface layer is dark gray and dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 36 inches thick. It is friable. The upper part is brown silty clay loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has grayish brown mottles. In places the surface layer is dark grayish brown silt loam about 7 inches thick.

Included with this soil in mapping are small areas of Lindley soils. These soils are on the lower part of side slopes. They make up less than 5 percent of the unit.

Permeability of this Fayette soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium.

Most areas are used as woodland. Some are used as permanent pasture. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. It is best suited to hay and pasture. If cultivated crops are grown, erosion is a serious hazard. A system of conservation tillage that leaves crop residue on the surface, contour farming, stripcropping, grassed waterways, and a cropping sequence that includes grasses and legumes help to prevent excessive soil loss. Tilth generally is fair in the surface layer. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Gullying is a severe hazard along livestock trails. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IVe.

163E2—Fayette silt loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is on short, convex side slopes in the uplands. Areas range from 5 to 20 acres in size and are elongated.

Typically, the surface layer is dark grayish brown and brown, friable silt loam about 8 inches thick. It is mixed with streaks and pockets of dark yellowish brown silty clay loam from the subsoil. The subsoil is about 34 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has grayish brown mottles. In places the surface layer is brown silty clay loam.

Included with this soil in mapping are small areas of Nordness soils on the lower part of side slopes. These soils are underlain by limestone bedrock at a depth of 8 to 20 inches. They make up less than 5 percent of the unit.

Permeability of this Fayette soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 1.5 to 2.5 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium.

Many areas are cultivated. A few are pastured. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. It is best suited to hay and pasture. If cultivated crops are grown, further erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, stripcropping, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes help to prevent excessive soil loss. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Gullying is a severe hazard along livestock trails. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby increases the quality of the pasture and the fertility of the soil.

The land capability classification is IVe.

163E3—Fayette silty clay loam, 14 to 18 percent slopes, severely eroded. This moderately steep, well

drained soil is on short, convex side slopes in the uplands. The slopes are dissected by gullies and waterways. Areas range from 5 to 20 acres in size and are elongated.

Typically, the surface layer is brown, friable silty clay loam about 8 inches thick. About 10 to 15 percent of the surface layer is streaks and pockets of dark brown silt loam from the original surface layer. The subsoil is about 30 inches thick. It is yellowish brown and friable. The upper part is silty clay loam, and the lower part is silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has grayish brown mottles. In places the surface layer is dark grayish brown and brown silt loam.

Included with this soil in mapping are small areas of Lindley soils on the lower part of side slopes. These soils have a surface layer of loam. They make up less than 5 percent of the unit.

Permeability of this Fayette soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 0.5 to 1.5 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium.

Many areas are cultivated. Some are used as permanent pasture. This soil is unsuited to cultivated crops because of a serious hazard of further erosion. It is moderately suited to grasses and legumes for hay and pasture. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture. More nitrogen generally is needed on this soil than on the less eroded Fayette soils. Also, more intense management is needed to improve productivity and tilth. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of plants or hay helps to control erosion. Reseeding may be difficult because the organic matter content is lower in this soil than in the less eroded Fayette soils. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue or orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIe.

163F—Fayette silt loam, 18 to 25 percent slopes. This steep, well drained soil is on short, convex side slopes in the uplands. Areas range from 5 to 20 acres in size and are elongated.

Typically, the surface layer is very dark gray, friable silt loam about 3 inches thick. The subsurface layer is dark gray and dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 36 inches thick. It is friable. The upper part is brown silty clay loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has grayish brown mottles. In places the surface layer is dark grayish brown silt loam about 7 inches thick.

Included with this soil in mapping are small areas of Nordness soils on the lower part of side slopes. These soils are 5 to 20 inches deep over limestone bedrock. They make up about 5 to 10 percent of the unit.

Permeability of this Fayette soil is moderate, and runoff is very rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium.

Most areas support native hardwoods. Some are used as permanent pasture. This soil is unsuited to cultivated crops because of the slope and a severe hazard of erosion. It is moderately suited to grasses and legumes for hay and pasture. Operating farm machinery is difficult because of the slope and because of gullies and waterways. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet.

A cover of pasture plants or hay helps to control erosion; however, production may be low. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIe.

163F2—Fayette silt loam, 18 to 25 percent slopes, moderately eroded. This steep, well drained soil is on short, convex side slopes in the uplands. Areas range from 5 to 20 acres in size and are elongated.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. It is mixed with streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is about 33 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam, the next part is yellowish brown silty clay

loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has grayish brown mottles. In places the surface layer is brown silty clay loam.

Included with this soil in mapping are small areas of Nordness soils on the lower part of side slopes. These soils are 8 to 20 inches deep over limestone bedrock. They make up about 5 percent of the unit.

Permeability of this Fayette soil is moderate, and runoff is very rapid. Available water capacity is high. The content of organic matter in the surface layer is 1.5 to 2.5 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium.

Many areas are cultivated. Some are pastured. This soil is unsuited to cultivated crops because of the slope and a severe hazard of erosion. It is only moderately suited to grasses and legumes for hay and pasture. Operating farm machinery is difficult because of the slope and because of gullies and waterways. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet.

A cover of pasture plants or hay helps to control erosion; however, production may be low. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIe.

163F3—Fayette silty clay loam, 18 to 25 percent slopes, severely eroded. This steep, well drained soil is on short, convex side slopes in the uplands. The slopes are dissected by gullies and waterways. Areas range from 5 to 10 acres in size and are elongated.

Typically, the surface layer is brown, friable silty clay loam about 8 inches thick. About 10 to 15 percent of the surface layer is streaks and pockets of dark brown material from the original surface layer. The subsoil is about 30 inches thick. It is yellowish brown and friable. The upper part is silty clay loam, the next part is silt loam, and the lower part is silt loam that has grayish brown mottles. The substratum to a depth of about 60 inches is yellowish brown silt loam that has grayish brown mottles. In places the surface layer is dark grayish brown and brown silt loam.

Included with this soil in mapping are small areas of Lindley soils on the lower part of side slopes. These soils have a surface layer of loam. They make up less than 5 percent of the unit.

Permeability of this Fayette soil is moderate, and runoff is very rapid. Available water capacity is high. The content of organic matter in the surface layer is 0.5 to 1.5 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium.

Many areas are cultivated. Some are used as permanent pasture. This soil is unsuited to cultivated crops because of the slope and a severe hazard of erosion. It is only moderately suited to grasses and legumes for hay and pasture. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture. Operating farm machinery is difficult because of the slope and the gullies and waterways.

A cover of pasture plants or hay helps to control erosion. Reseeding may be difficult because the organic matter content is lower in this soil than in the less eroded Fayette soils. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIe.

163G—Fayette silt loam, 25 to 40 percent slopes. This very steep, well drained soil is on short, convex side slopes in the uplands. Areas range from 5 to 30 acres in size and are elongated.

Typically, the surface layer is very dark gray, friable silt loam about 2 inches thick. The subsurface layer is gray and dark grayish brown, friable silt loam about 6 inches thick. The subsoil is about 34 inches thick. It is friable. The upper part is brown silty clay loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has grayish brown mottles. In places the surface layer is dark grayish brown and is about 6 inches thick.

Included with this soil in mapping are small areas of Nordness soils. These soils are 8 to 20 inches deep over limestone bedrock. They make up less than 10 percent of the unit.

Permeability of this Fayette soil is moderate, and runoff is very rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a high supply of

available phosphorus and a low supply of available potassium.

Most areas are wooded or in permanent pasture. This soil generally is unsuited to cultivated crops because of the slope and a severe hazard of erosion. It is poorly suited to hay and pasture. Ordinary farm machinery cannot be used because of the slope.

A cover of pasture plants helps to control erosion; however, production may be low. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIIe.

174—Bolan loam, 0 to 2 percent slopes. This nearly level, well drained soil is on stream terraces along the major rivers. Areas range from 10 to 50 acres in size and are irregularly shaped.

Typically, the surface layer is black, friable loam about 10 inches thick. The subsurface layer is black, very dark brown, and very dark grayish brown, friable loam about 22 inches thick. The subsoil is about 16 inches thick. The upper part is dark brown, friable fine sandy loam, and the lower part is brown, loose loamy fine sand. The substratum to a depth of about 60 inches is dark yellowish brown and yellowish brown loamy sand and fine sand. In places, the surface layer is fine sandy loam and the soil is slightly droughty.

Permeability is moderate in the surface layer, the subsurface layer, and the upper part of the subsoil and rapid in the lower part of the subsoil and the substratum. Runoff is slow. Available water capacity is moderate. The content of organic matter in the surface layer is 3 to 4 percent. The surface layer generally has a very low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. It is droughty, however, because of the moderate available water capacity. Also, soil blowing is a hazard if cultivated crops are grown. A system of conservation tillage that leaves crop residue on the surface conserves moisture and helps to control soil blowing. Good tilth generally can be easily maintained. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to control soil blowing and prevent deterioration of tilth.

A cover of pasture plants or hay helps to control erosion. Soil blowing is a hazard, however, if overgrazing reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, timely deferment of grazing, especially during dry periods, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIs.

175—Dickinson fine sandy loam, 0 to 2 percent slopes. This nearly level, somewhat excessively drained soil is on stream terraces. Areas range from 10 to 80 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, very friable fine sandy loam about 10 inches thick. The subsurface layer is very friable fine sandy loam about 12 inches thick. The upper part is very dark grayish brown, and the lower part is dark brown. The subsoil to a depth of about 60 inches is yellowish brown and dark yellowish brown and is very friable. The upper part is fine sandy loam, and the lower part is loamy fine sand. In places the surface layer is dark brown loamy sand.

Included with this soil in mapping are small areas of the excessively drained Sparta soils. These soils are in landscape positions similar to those of the Dickinson soil. They make up less than 5 percent of the unit.

Permeability of this Dickinson soil is moderately rapid, and runoff is slow. Available water capacity is low. The content of organic matter in the surface layer is 2 to 3 percent. The surface layer generally has a very low supply of available phosphorus and potassium.

Most areas are cultivated. Some are used for pasture or hay. Many small areas are cropped along with larger areas of adjacent soils that are better suited to crops. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. Droughtiness is a limitation in most years unless rainfall is timely. Also, soil blowing is a hazard during most years. Areas on alluvial terraces can be irrigated easily because they are nearly level and commonly are near an adequate water supply. A system of conservation tillage that leaves crop residue on the surface and cover crops help to prevent excessive soil loss and conserve moisture during periods of low humidity and high-velocity winds. The soil warms up quickly in the spring, thus stimulating early plant growth. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the available water capacity.

A cover of pasture plants or hay helps to control erosion. Soil blowing is a hazard, however, if overgrazing reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, timely deferment of grazing, especially during dry periods, and

restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIIs.

175B—Dickinson fine sandy loam, 2 to 5 percent slopes. This gently sloping, somewhat excessively drained soil is on uplands and stream terraces. Areas range from 10 to 60 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, very friable fine sandy loam about 8 inches thick. The subsurface layer is very dark grayish brown, very friable fine sandy loam about 8 inches thick. The subsoil is about 31 inches thick. The upper part is dark brown and brown, very friable fine sandy loam; the next part is dark yellowish brown, very friable fine sandy loam; and the lower part is yellowish brown and dark yellowish brown, very friable loamy fine sand. The substratum to a depth of about 60 inches is dark yellowish brown and yellowish brown loamy fine sand. In places the surface layer is dark brown loamy sand.

Included with this soil in mapping are small areas of the excessively drained Sparta soils. These soils are in landscape positions similar to those of the Dickinson soil. They make up about 5 percent of the unit.

Permeability of this Dickinson soil is moderately rapid, and runoff is slow. Available water capacity is low. The content of organic matter in the surface layer is 2 to 3 percent. The surface layer generally has a very low supply of available phosphorus and potassium.

Most areas are cultivated. Some are used for pasture or hay. Many small areas are cropped along with large areas of adjacent soils that are better suited to crops. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. Droughtiness is a limitation in most years unless rainfall is timely. Also, soil blowing is a hazard in areas where cultivated crops are grown. It can result in damage to seedlings on this soil and on the adjoining soils unless the surface is protected by a plant cover. A system of conservation tillage that leaves crop residue on the surface, cover crops, and grassed waterways help to prevent excessive soil loss. The soil is poorly suited to terracing because ridging the moderately coarse textured material is difficult and because the underlying coarse textured material is too close to the surface. If terraces are built, cuts should not expose the coarse textured material in terrace channels. The soil warms up quickly in the spring, thus stimulating early plant growth. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the available water capacity.

A cover of pasture plants or hay helps to control erosion. Soil blowing is a hazard, however, if overgrazing reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, timely deferment of grazing, especially during dry periods, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIIe.

175C—Dickinson fine sandy loam, 5 to 9 percent slopes. This moderately sloping, somewhat excessively drained soil is on uplands and stream terraces. Areas range from 5 to 20 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, very friable fine sandy loam about 8 inches thick. The subsurface layer is dark brown, very friable fine sandy loam about 4 inches thick. The subsoil is about 24 inches thick. The upper part is brown, very friable fine sandy loam, and the lower part is dark yellowish brown and yellowish brown, loose loamy sand. The substratum to a depth of about 60 inches is yellowish brown sand. In places loamy glacial till is at a depth of about 40 inches.

Permeability is moderately rapid, and runoff is slow. Available water capacity is low. The content of organic matter in the surface layer is 1.5 to 2.5 percent. The subsoil generally has a very low supply of available phosphorus and potassium.

Most areas are cultivated or used for hay and pasture. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, soil blowing and water erosion are hazards. Stripcropping, a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, or a combination of these practices helps to prevent excessive soil loss. The soil is droughty in periods of below normal rainfall. Good tilth generally can be easily maintained. Returning crop residue to the soil or regularly adding other organic material conserves moisture, improves fertility, and helps to maintain tilth.

A cover of pasture plants or hay helps to control erosion. Soil blowing is a hazard, however, if overgrazing reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, timely deferment of grazing, especially during dry periods, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIIe.

179D2—Gara loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is on side slopes in the uplands. Areas range from 5 to 30 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable loam about 7 inches thick. It is mixed with streaks and pockets of yellowish brown material from the subsoil. The subsoil is about 36 inches thick. The upper part is yellowish brown, friable and firm clay loam, and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In places the surface layer is thicker or darker.

Permeability is moderately slow, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The surface layer generally has a low supply of available phosphorus and a very low supply of available potassium.

Many areas are cultivated. Some are used for pasture or hay. Nearly all were cultivated in the past. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. If row crops are grown, soil losses are severe in most years. A system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, stripcropping, grassed waterways, and a cropping sequence that includes grasses and legumes help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the tilth and fertility of the soil.

The land capability classification is IVe.

179E2—Gara loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is on convex side slopes in the uplands. Areas range from 5 to 30 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable loam about 7 inches thick. It is mixed with streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is yellowish brown clay loam about 36 inches thick. The upper part is friable, and the lower part is mottled and firm. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Permeability is moderately slow, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The surface layer generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for hay and pasture. Some are cultivated. Most have been cultivated in the past. This soil generally is unsuited to cultivated crops because the hazard of erosion is severe. It is moderately suited to grasses and legumes for hay and pasture. Operating farm machinery is difficult because of the slope and because of gullies and waterways.

A cover of pasture plants or hay helps to control erosion; however, production may be low. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIe.

179E3—Gara clay loam, 14 to 18 percent slopes, severely eroded. This moderately steep, well drained soil is on convex side slopes in the uplands. Areas range from 5 to 50 acres in size and are irregularly shaped.

Typically, the surface layer is very dark yellowish brown, friable clay loam about 8 inches thick. It is mixed with streaks and pockets of dark brown clay loam. The subsoil is about 35 inches thick. The upper part is dark yellowish brown, friable clay loam, and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Permeability is moderately slow, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 1 to 2 percent. The surface layer generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for hay and pasture. Some are cultivated. Most have been cultivated in the past. This soil is unsuited to cultivated crops because the hazard of erosion is severe. It is poorly suited to grasses and legumes for hay and pasture. Returning crop residue to the soil or regularly adding other organic material and deferring tillage when the soil is wet help to maintain tilth, improve fertility, prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Reseeding may be difficult because the surface

layer is clay loam and is lower in organic matter content than that of the less eroded Gara soils. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIe.

179F2—Gara loam, 18 to 25 percent slopes, moderately eroded. This steep, well drained soil is on convex side slopes in the uplands. Areas range from 5 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable loam about 7 inches thick. It is mixed with streaks and pockets of yellowish brown material from the subsoil. The subsoil is about 35 inches thick. The upper part is yellowish brown, friable loam, and the lower part is yellowish brown, mottled clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Permeability is moderately slow, and runoff is very rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The surface layer generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for hay and pasture. Some are cultivated. Most have been cultivated in the past. This soil is unsuited to cultivated crops and is poorly suited to grasses and legumes for hay and pasture. If the soil is cultivated, erosion is a severe hazard and the slope is too steep for the operation of ordinary farm machinery.

A cover of pasture plants or hay helps to control erosion; however, production may be low. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIIe.

179F3—Gara clay loam, 18 to 25 percent slopes, severely eroded. This steep, well drained soil is on convex side slopes in the uplands. Areas range from 5 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is dark yellowish brown, friable clay loam about 6 inches thick. It is mixed with streaks and pockets of dark brown clay loam. The subsoil is yellowish brown clay loam about 35 inches thick. The upper part is friable, and the lower part is mottled and firm. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Permeability is moderately slow, and runoff is very rapid. Available water capacity is high. The content of organic matter in the surface layer is 1 to 2 percent. The surface layer generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for hay and pasture. Some are cultivated. Most have been cultivated in the past. This soil is poorly suited to hay and pasture. It is unsuited to cultivated crops because the hazard of erosion is severe and the slope is too steep for the operation of ordinary farm machinery.

A cover of pasture plants or hay helps to control erosion. Reseeding may be difficult because the surface layer is clay loam and is lower in organic matter content than that of the less eroded Gara soils. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is VIIe.

184—Klinger silty clay loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on broad ridgetops in the uplands. Areas range from 10 to 100 acres in size and are irregularly shaped.

Typically, the surface layer is black, friable silty clay loam about 9 inches thick. The subsurface layer is black, very dark brown, and dark brown, friable silty clay loam about 10 inches thick. The subsoil is about 33 inches thick. The upper part is dark grayish brown, grayish brown, and brown, mottled, friable silty clay loam, and the lower part is yellowish brown, firm loam. The substratum to a depth of about 60 inches is yellowish brown loam. In places the surface layer is lighter in color, has a lower content of organic matter, or is thinner.

Included with this soil in mapping are small areas of the poorly drained Maxfield soils in the flatter areas and small areas of soils that are more sloping. These included soils are subject to erosion. They make up 5 to 10 percent of the unit.

Permeability of this Klinger soil is moderate, and surface runoff is slow. The seasonal high water table is

at a depth of 2 to 4 feet. Available water capacity is high. The content of organic matter in the surface layer is 5 to 6 percent. The surface layer generally has a very low supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. A system of conservation tillage that leaves crop residue on the surface helps to control soil blowing. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to maintain tilth. A tile drainage system may be needed.

This soil has only slight limitations affecting the selection of productive forage species. Restricting grazing and equipment use during wet periods minimizes compaction of the soil and damage to the vegetation and thus helps to maintain tilth and productivity.

The land capability classification is I.

220—Nodaway silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is in areas of recent deposition on flood plains. It is subject to flooding. Areas range from 5 to 50 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silt loam about 10 inches thick. The substratum to a depth of about 60 inches is dark grayish brown, brown, dark brown, and very dark grayish brown, friable, stratified silt loam. In places dark silty clay loam is within a depth of 36 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Dockery soils. These soils are at elevations similar to those of the Nodaway soil. They are wetter than the Nodaway soil. They make up less than 10 percent of the unit.

Permeability of this Nodaway soil is moderate, and runoff is slow. Available water capacity is high or very high. The seasonal high water table is at a depth of 3 to 5 feet. The content of organic matter in the surface layer is about 2 to 3 percent. The substratum generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. The flooding and the seasonal high water table are limitations. Measures that reduce the wetness improve the timeliness of fieldwork. Good tilth generally can be easily maintained. Returning crop residue to the soil or regularly adding other organic material helps to maintain tilth, improves fertility, prevents surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control soil blowing. Unless the soil is drained, forage production is limited to those crop mixtures that are tolerant of the wetness. An example of such a mixture is birdsfoot trefoil and tall fescue or red clover and timothy. Restricting grazing and equipment use during wet periods minimizes compaction and thus helps to maintain tilth and productivity. Pasture rotation is beneficial.

The land capability classification is IIw.

225—Lawler loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on stream terraces. Areas range from 10 to more than 80 acres in size and are irregularly shaped.

Typically, the surface layer is black, friable loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable clay loam about 7 inches thick. The subsoil is about 13 inches thick. It is dark grayish brown, mottled, and friable. The upper part is clay loam, and the lower part is sandy clay loam. The substratum to a depth of about 60 inches is dark grayish brown, mottled loamy coarse sand.

Included with this soil in mapping are small areas of soils that have a surface layer of sandy loam. These soils have a low content of organic matter and a low available water capacity. They are in positions on the landscape similar to those of the Lawler soil. Also included are small areas of poorly drained soils in slight depressions. Tillage commonly is delayed in these areas of poorly drained soils unless the soils are drained. Included soils make up about 5 to 7 percent of the unit.

Permeability of this Lawler soil is moderate in the subsoil and very rapid in the substratum. Runoff is slow. The seasonal high water table is at a depth of 2 to 4 feet. Available water capacity is low or moderate. The content of organic matter in the surface layer is 4 to 5 percent. The surface layer generally has a very low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. The water table is moderately high in the spring but drops rapidly during the growing season. In some areas tile drains are beneficial during wet periods, but installing the tile is difficult because of the loose, water-bearing sand and gravel. If cultivated crops are grown, erosion is a hazard in areas that are plowed in the fall and not protected by a plant cover. A system of conservation tillage that leaves crop residue on the surface helps to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material

improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay is effective in improving soil aeration and tilth. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIs.

254—Zook silty clay, sandy substratum, 0 to 2 percent slopes. This nearly level, poorly drained soil is on flood plains along major rivers. It is subject to flooding, but most areas are protected by drainage ditches. Areas range from 40 to 300 acres in size and are irregularly shaped.

Typically, the surface layer is black, firm silty clay about 10 inches thick. The subsurface layer is about 17 inches thick. The upper part is black clay, and the lower part is very dark gray, firm silty clay. The subsoil is olive gray, mottled, firm silty clay about 26 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled, friable loamy sand.

Permeability is slow in the solum and rapid in the substratum. Runoff is slow. The seasonal high water table is at a depth of 1 to 3 feet. The content of organic matter in the surface layer is 3 to 4 percent. The shrink-swell potential is high. The surface layer generally has a medium supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. Subsurface drains are needed to reduce the wetness and provide aeration and a deep root zone for plants. They generally function satisfactorily if closely spaced, but they drain the soil slowly. A surface drainage system also is needed. Tilth generally is fair or poor in the surface layer. Returning crop residue to the soil and delaying fieldwork when the soil is wet help to prevent surface compaction and improve tilth.

Grasses and legumes that are tolerant of the wetness should be selected for planting. A drainage system is needed in most areas. Overgrazing or grazing during wet periods causes surface compaction.

The land capability classification is IIIw.

273C—Olmitz loam, 3 to 9 percent slopes. This gently sloping and moderately sloping, moderately well drained soil is on low, slightly convex or plane foot slopes. It generally is downslope from moderately steep or steep soils that formed in clay loam glacial till. Areas range from 5 to 30 acres in size and are long and narrow.

Typically, the surface layer is black, friable loam about 9 inches thick. The subsurface layer is friable loam about 21 inches thick. The upper part is very dark brown, the next part is very dark grayish brown, and the lower part is dark brown. The subsoil to a depth of about 60 inches is friable clay loam. The upper part is dark brown, and the lower part is dark yellowish brown.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 3 to 4 percent. The surface layer has a very low supply of available phosphorus and a low supply of available potassium.

Many areas are cultivated. Some are used for hay and pasture or as sites for dwellings. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overwash and siltation from adjacent soils may damage the hay and pasture unless the soils upslope are protected by conservation measures. Proper stocking rates and restricted use during wet periods minimize compaction and thus help to maintain tilth and control runoff.

The land capability classification is IIIe.

284—Flagler sandy loam, 0 to 2 percent slopes. This nearly level, somewhat excessively drained soil is on stream terraces. Areas range from 5 to 80 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, very friable sandy loam about 9 inches thick. The subsurface layer is very dark grayish brown, very friable sandy loam about 7 inches thick. The subsoil is about 14 inches thick. The upper part is dark yellowish brown, mottled, very friable sandy loam, and the lower part is dark yellowish brown, dark brown, and brown, very friable loamy sand. The substratum to a depth of about 60 inches is yellowish brown and dark yellowish brown loamy sand and sand that contain some fine gravel.

Included with this soil in mapping are small areas of the somewhat poorly drained Lawler soils. These soils are wet for longer periods than the Flagler soil. The wetness can interfere with tillage. Included soils make up less than 5 percent of the unit.

Permeability is moderately rapid in the upper part of

this Flagler soil and very rapid in the lower part. Runoff is slow. Available water capacity is low. The content of organic matter in the surface layer is 2 to 3 percent. The surface layer generally has a very low supply of available phosphorus and potassium.

Most areas are cultivated. Some are used for hay and pasture. Many small areas are cropped along with larger areas of adjacent soils that are better suited to crops. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. Droughtiness is a limitation in most years unless rainfall is timely. Also, soil blowing is a hazard during most years. Some areas can be easily irrigated because they are nearly level and commonly are near an adequate water supply. A system of conservation tillage that leaves crop residue on the surface and cover crops help to prevent excessive soil loss and conserve moisture during periods of low humidity and high-velocity winds. The soil warms up quickly in the spring, thus stimulating early plant growth. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration and the available water capacity.

A cover of pasture plants or hay helps to control erosion. Overgrazing or grazing when the soil is too wet or too dry reduces the extent of the protective plant cover and causes deterioration of the plant community. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet and dry periods help to keep the pasture in good condition.

The land capability classification is IIIs.

291—Atterberry silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on broad ridgetops and divides in the uplands. Areas range from 5 to 60 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsoil is mottled, friable silty clay loam about 40 inches thick. The upper part is brown, and the lower part is grayish brown. The substratum to a depth of about 60 inches is grayish brown, mottled silty clay loam.

Included with this soil in mapping are soils that have a thinner, lighter colored surface layer and that are lower in fertility and in content of organic matter. These soils make up less than 5 percent of the unit. Also included are a few small areas of the poorly drained Walford soils on the lower part of ridgetops. The wetness in areas of the Walford soils delays fieldwork for several days during wet periods unless tile drains are installed. Walford soils make up less than 2 percent of the unit.

Permeability of this Atterberry soil is moderate, and runoff is slow. The seasonal high water table is at a depth of 1 to 3 feet. Available water capacity is high. The content of organic matter in the surface layer is 3 to 4 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Installing drainage tile improves the timeliness of fieldwork. A system of conservation tillage that leaves crop residue on the surface helps to prevent excessive soil loss. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

A cover of pasture plants or hay helps to control soil blowing. This soil has only slight limitations affecting the selection of productive forage species. Restricting grazing and equipment use during wet periods minimizes compaction of the soil and damage to the vegetation and thus helps to maintain tilth and productivity.

The land capability classification is I.

293C—Chelsea-Lamont-Fayette, sandy substratum, complex, 5 to 9 percent slopes. These moderately sloping, well drained and excessively drained soils are on ridgetops and side slopes in the uplands. The Chelsea soil is excessively drained, and the Lamont and Fayette soils are well drained. Areas range from 20 to 100 acres in size. They are about 40 percent Chelsea soil, 30 percent Lamont soil, and 25 percent Fayette soil. These soils occur as areas so intricately mixed or so small that separating them in mapping is not practical.

Typically, the surface layer of the Chelsea soil is brown, very friable loamy fine sand about 8 inches thick. The subsurface layer is about 42 inches thick. The upper part is dark yellowish brown, very friable loamy fine sand, and the lower part is yellowish brown, loose loamy fine sand and fine sand. Below this to a depth of about 60 inches is brown, loose loamy fine sand and fine sand that have 0.5- to 1.25-inch-thick bands of brown loamy fine sand.

Typically, the surface layer of the Lamont soil is dark grayish brown, very friable fine sandy loam about 6 inches thick. The subsurface layer is brown, very friable fine sandy loam about 8 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is dark yellowish brown, very friable fine sandy loam, and the lower part is yellowish brown, loose fine sand that has bands of loamy sand.

Typically, the surface layer of the Fayette soil is very dark gray, friable silt loam about 4 inches thick. The subsurface layer is grayish brown, friable silt loam about 7 inches thick. The subsoil is about 34 inches thick. It is friable. The upper part is brown silt loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown loamy sand.

Included with these soils in mapping are small areas of Lindley soils. Lindley soils formed in glacial till. They make up about 5 percent of the unit.

Permeability is rapid in the Chelsea soil and moderately rapid in the Lamont soil. It is moderate in the subsoil of the Fayette soil and rapid in the sandy substratum. Runoff is medium on all three soils. Available water capacity is low in the Chelsea soil, moderate in the Lamont soil, and high in the Fayette soil. The content of organic matter is less than 1 percent in the surface layer of the Chelsea soil, 1 to 2 percent in the surface layer of the Lamont soil, and 2 to 3 percent in the surface layer of the Fayette soil. The subsoil of the Chelsea soil has a very low supply of available phosphorus and a low supply of available potassium. The subsoil of the Lamont soil has a low supply of available phosphorus and a very low supply of available potassium. The subsoil of the Fayette soil has a high supply of available phosphorus and a low supply of available potassium.

Many areas are used as pasture or woodland. Most of the areas have been cropped in the past. These soils are poorly suited to corn, soybeans and small grain because of droughtiness and low fertility. They are moderately suited to grasses and legumes for hay and pasture. If these soils are used for cultivated crops, water erosion is a hazard. Soil blowing is an additional hazard on the Chelsea and Lamont soils. A system of conservation tillage that leaves crop residue on the surface throughout the year and cover crops help to prevent excessive soil loss. Contour farming and terracing are beneficial in places. This map unit is suited to terracing in a few areas where the Fayette soil is the dominant soil; however, the topography generally is not uniform and the construction of terraces is difficult. Returning crop residue to the soils or regularly adding other organic material improves fertility and helps to maintain tilth.

A cover of pasture plants or hay helps to control erosion. Overgrazing or grazing when the Fayette soil is wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture in good condition.

The land capability classification is IIIe.

293E—Chelsea-Lamont-Fayette, sandy substratum, complex, 9 to 18 percent slopes. These strongly sloping and moderately steep soils are in the uplands. The excessively drained Chelsea and well drained Lamont soils are on side slopes, and the well drained Fayette soil is on ridgetops. Areas range from 5 to 40 acres in size and are irregularly shaped. They are about 40 percent Chelsea soil, 30 percent Lamont soil, and 25 percent Fayette soil. These soils occur as areas so intricately mixed or so small that mapping them separately is impractical.

Typically, the surface layer of the Chelsea soil is dark grayish brown, very friable loamy fine sand about 8 inches thick. The subsurface layer is dark yellowish brown and yellowish brown, loose loamy fine sand about 40 inches thick. Below this to a depth of about 60 inches is yellowish brown, loose fine sand that has many bands of dark brown loamy fine sand.

Typically, the surface layer of the Lamont soil is dark grayish brown, very friable fine sandy loam about 9 inches thick. The subsurface layer is brown, very friable fine sandy loam about 5 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is dark yellowish brown, strong brown, and brown, friable and very friable sandy clay loam and fine sandy loam, and the lower part is yellowish brown, loose fine sand that has bands of loamy sand.

Typically, the surface layer of the Fayette soil is very dark gray, friable silt loam about 3 inches thick. The subsurface layer is dark gray and dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 36 inches thick. It is friable. The upper part is brown silty clay loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown and brown loamy fine sand. In places the surface layer is darker and thicker.

Included with these soils in mapping are small areas of Lindley soils. Lindley soils formed in glacial till. They make up about 5 percent of the unit.

Permeability is rapid in the Chelsea soil and moderately rapid in the Lamont soil. It is moderate in the subsoil of the Fayette soil and rapid in the sandy substratum. Runoff is rapid on all three soils. Available water capacity is low in the Chelsea soil, moderate in the Lamont soil, and high in the Fayette soil. The content of organic matter is less than 1 percent in the surface layer of the Chelsea soil and 1 to 2 percent in the surface layer of the Lamont and Fayette soils. The subsurface layer of the Chelsea soil generally has a very low supply of available phosphorus and a low supply of available potassium. The subsoil of the

Lamont soil has a low supply of available phosphorus and a very low supply of available potassium. The subsoil of the Fayette soil generally has a high supply of available phosphorus and a low supply of available potassium.

Most areas are used for pasture and hay. These soils are unsuited to corn, soybeans, and small grain and are moderately suited to grasses and legumes for hay and pasture. Yields are very low, and erosion is a severe hazard if row crops are grown.

A cover of pasture plants or hay helps to control erosion. Because the Chelsea soil is excessively drained, the species selected for planting should be limited to those that are tolerant of dry conditions. Examples of such species are alfalfa, smooth brome, crownvetch, and tall fescue. The growth of pasture plants and hay is inhibited during hot, dry periods. Operating ordinary farm machinery is difficult and hazardous because of the slope. Restricting grazing and equipment use during dry periods minimizes damage to the plant cover and helps to control soil blowing. Pasture rotation is beneficial.

The land capability classification is VIe.

293F—Chelsea-Lamont-Fayette, sandy substratum, complex, 18 to 25 percent slopes. These steep soils are in the uplands. The excessively drained Chelsea and well drained Lamont soils are on side slopes, and the well drained Fayette soil is on ridgetops. Areas range from 5 to 40 acres in size and are irregularly shaped. They are about 40 percent Chelsea soil, 30 percent Lamont soil, and 25 percent Fayette soil. These soils occur as areas so intricately mixed or so small that mapping them separately is impractical.

Typically, the surface layer of the Chelsea soil is dark grayish brown, very friable loamy fine sand about 3 inches thick. The subsurface layer is dark yellowish brown and yellowish brown, loose loamy fine sand and fine sand about 38 inches thick. Below this to a depth of about 60 inches is yellowish brown fine sand that has many bands of dark brown loamy fine sand.

Typically, the surface layer of the Lamont soil is brown, very friable fine sandy loam about 9 inches thick. The subsurface layer is dark yellowish brown, very friable fine sandy loam about 5 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is dark yellowish brown, very friable fine sandy loam, and the lower part is yellowish brown, loose fine sand that has bands of loamy sand.

Typically, the surface layer of the Fayette soil is very dark gray, friable silt loam about 2 inches thick. The subsurface layer is dark grayish brown silt loam about 7 inches thick. The subsoil is about 36 inches thick. The upper part is brown silty clay loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown and brown loamy fine sand. In places the surface layer is darker and thicker.

Included with these soils in mapping are small areas of Lindley soils. Lindley soils formed in glacial till. They make up about 5 percent of the unit.

Permeability is rapid in the Chelsea soil and moderately rapid in the Lamont soil. It is moderate in the subsoil of the Fayette soil and rapid in the sandy substratum. Runoff is rapid on all three soils. Available water capacity is low in the Chelsea soil, moderate in the Lamont soil, and high in the Fayette soil. The content of organic matter is less than 1 percent in the surface layer of the Chelsea soil, 1 to 2 percent in the surface layer of the Lamont soil, and 2 to 3 percent in the surface layer of the Fayette soil. The subsurface layer of the Chelsea soil generally has a very low supply of available phosphorus and a low supply of available potassium. The subsoil of the Lamont soil has a low supply of available phosphorus and a very low supply of available potassium. The subsoil of the Fayette soil generally has a high supply of available phosphorus and a low supply of available potassium.

Most areas are used for pasture and hay. These soils are unsuited to corn, soybeans, and small grain and are moderately suited to grasses and legumes for hay and pasture. Yields are very low, and erosion is a severe hazard if row crops are grown.

A cover of grasses and legumes helps to control soil blowing and water erosion. Because the Chelsea soil is excessively drained, the species selected for planting should be limited to those that are tolerant of dry conditions. Examples of such species are alfalfa, smooth brome, crownvetch, and tall fescue. The growth of pasture plants and hay is inhibited during hot, dry periods. Operating ordinary farm machinery is difficult and hazardous because of the slope. Restricting grazing and equipment use during dry periods minimizes damage to the plant cover and helps to control soil blowing. Pasture rotation is beneficial.

The land capability classification is VIIe.

313G—Gosport silt loam, 25 to 40 percent slopes. This very steep, moderately well drained soil is on convex side slopes and in escarpmentlike areas that parallel the major streams in the uplands. Areas commonly range from 10 to more than 60 acres in size and are long and narrow or irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is yellowish brown, friable silt loam about 4 inches thick. The subsoil is mottled, very firm

silty clay about 27 inches thick. The upper part is yellowish brown, the next part is brown, and the lower part is brown and yellowish brown. Mottled clay shale bedrock is at a depth of about 38 inches.

Permeability is very slow, and runoff is very rapid. The seasonal high water table is at a depth of 1.5 to 3.0 feet. Available water capacity is moderate. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a very low supply of available phosphorus and potassium.

Most areas are used as pasture or woodland. This soil is unsuited to cultivated crops because of the slope and a severe hazard of erosion. It is poorly suited to hay and pasture.

A cover of pasture plants helps to control erosion. Managing areas that have been cleared for pasture is difficult because of the slope. Erosion is a severe hazard in these areas because reestablishing a plant cover is difficult. Maximum production of grasses and legumes can be achieved if the pasture or hayland is well managed. Such forage species as tall fescue and orchardgrass are better suited to this soil than other forage species because they are more resistant to trampling by cattle. Applications of fertilizer, weed and brush control, rotation and deferred grazing, proper stocking rates, and adequate livestock watering facilities help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

The land capability classification is VIIe.

352B—Whittier silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on convex ridgetops in the uplands and on stream terraces. Areas range from 5 to 20 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsoil is about 32 inches thick. The upper part is dark yellowish brown and yellowish brown, friable silty clay loam, and the lower part is yellowish brown, very friable sandy loam. The substratum to a depth of about 60 inches is yellowish brown fine sand. In places depth to the sand is more than 60 inches.

Included with this soil in mapping are scattered areas of soils that have sand within a depth of 20 inches. These soils are more droughty than the Whittier soil. They make up 5 to 10 percent of the unit.

Permeability is moderate in the upper part of this Whittier soil and rapid in the lower part. Runoff is medium. Available water capacity is moderate. The content of organic matter in the surface layer is 2.5 to 3.5 percent. The subsoil generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, erosion is a hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface and contour farming. In places contour farming and terracing are difficult because the slopes are short and irregular. In areas where the soil is terraced, the coarse textured substratum is exposed and droughtiness is a management concern. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

A cover of pasture plants or hay helps to control erosion. Most forage crops grow well on this soil. Overgrazing causes compaction and poor tilth, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

The land capability classification is IIe.

352C2—Whittier silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is on side slopes in the uplands. Areas range from 5 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. It is mixed with streaks and pockets of brown material from the subsoil. The subsoil is about 28 inches thick. The upper part is dark yellowish brown, friable silty clay loam, and the lower part is yellowish brown, very friable sandy loam. The substratum to a depth of about 60 inches is yellowish brown fine sand. In some places the depth to sand is more than 60 inches. In other places the surface layer is lighter colored and has a lower content of organic matter.

Included with this soil in mapping are scattered areas of soils that have sand within a depth of 20 inches. These soils are more droughty than the Whittier soil. They make up 5 to 10 percent of the unit.

Permeability is moderate in the upper part of this Whittier soil and rapid in the lower part. Runoff is medium. Available water capacity is moderate. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If

the soil is used for cultivated crops, erosion is a hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface and contour farming. In places contour farming and terracing are difficult because the slopes are short and irregular. In areas where the soil is terraced, the coarse textured substratum is exposed and droughtiness is a management concern. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

A cover of pasture plants or hay helps to control erosion. Most forage crops grow well on this soil. Restricting grazing and equipment use during wet periods minimizes compaction and thus helps to maintain tilth and control runoff. Improved permanent pasture increases the content of organic matter. Pasture rotation is beneficial.

The land capability classification is IIIe.

354—Aquolls, ponded. These very poorly drained soils are in depressions on flood plains adjacent to the major streams and rivers. They are subject to ponding by runoff from adjacent areas. Areas range from 3 to 200 acres in size and are irregularly shaped.

Typically, the surface layer is black, friable silty clay loam or clay loam about 10 inches thick. The subsurface layer is black, very dark gray, or dark gray, friable silty clay loam, clay loam, loam, or sandy loam about 30 inches thick. The substratum to a depth of about 60 inches is very dark gray, dark gray, or gray silty clay loam, clay loam, loam, sandy loam, or loamy sand.

Permeability varies but generally is moderately slow to very slow. The seasonal high water table is 1 foot above the surface to 1 foot below the surface. Available water capacity generally is high. In most areas, small ponds are evident or the water table is at or near the surface throughout the year.

Most of the acreage is idle land or is used for wildlife habitat (fig. 12). These soils are suited to habitat for wetland wildlife but are unsuited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Installing an adequate drainage system is very difficult because suitable outlets are not available.

The land capability classification is VIIw.

377B—Dinsdale silty clay loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on ridges and side slopes in the uplands. Areas range from 2 to more than 50 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silty clay loam about 8 inches thick. The subsurface layer is dark brown, friable silty clay loam about 5 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is dark brown, brown, and dark yellowish brown, friable silty clay loam; the next part is yellowish brown, very friable sandy loam; and the lower part is yellowish brown, firm loam. A stone line separates the loess and the underlying firm glacial till in places.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 3 to 4 percent. The surface layer generally has a very low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface and terraces. If terraces are built, cuts should not expose the less productive underlying glacial till. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIe.

377C—Dinsdale silty clay loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on convex side slopes in the uplands. Areas range from 2 to more than 30 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silty clay loam about 7 inches thick. The subsurface layer is dark brown, friable silty clay loam about 7 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is brown and dark yellowish brown, friable silty clay loam, and the lower part is yellowish brown, firm loam and clay loam. A stone line separates the loess and the underlying firm glacial till in places.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 3 to 4 percent. The surface layer generally has a very low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. A

Figure 12.—Cattails and other water-tolerant plants in an area of Aquolls, ponded.

system of conservation tillage that leaves crop residue on the surface, grassed waterways, stripcropping, and terraces help to prevent excessive soil loss. If terraces are built, cuts should not expose the less productive underlying glacial till. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIIe.

377C2—Dinsdale silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is on convex side slopes in the uplands. Areas range from 2 to more than 30 acres in size and are irregularly shaped.

Typically, the surface layer is dark brown, friable silty clay loam about 9 inches thick. It is mixed with streaks and pockets of brown material from the subsoil. The subsoil extends to a depth of about 60 inches. The upper part is brown and dark yellowish brown, friable silty clay loam, and the lower part is yellowish brown, firm loam and clay loam. A stone line separates the

loess and the underlying firm glacial till in places.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 2.5 to 3.5 percent. The surface layer generally has a very low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, stripcropping, and terraces help to prevent excessive soil loss. If terraces are built, cuts should not expose the less productive underlying glacial till. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIIe.

382—Maxfield silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on concave slopes and at the head of drainageways in the uplands. Areas range from 10 to 25 acres in size and are irregularly shaped.

Typically, the surface layer is black, friable silty clay loam about 9 inches thick. The subsurface layer is black, mottled, friable silty clay loam about 13 inches thick. The subsoil is about 30 inches thick. The upper part is dark grayish brown, friable silty clay loam; the next part is grayish brown and brown, mottled, friable silty clay loam; and the lower part is dark grayish brown and yellowish brown, mottled, firm loam. The substratum to a depth of about 60 inches is yellowish brown loam.

Included with this soil in mapping are areas of the somewhat poorly drained Klinger soils in the higher, convex landscape positions. These soils make up about 2 to 5 percent of the unit.

Permeability of this Maxfield soil is moderate, and runoff is slow. Available water capacity is high. The seasonal high water table is at a depth of 1 to 2 feet. The content of organic matter in the surface layer is 6 to 8 percent. The subsoil generally has a very low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. It is suited to intensively grown row crops, but a drainage system is needed for optimum crop production. It lowers the water table and thus improves the timeliness of fieldwork and provides aeration and a deep root zone for plants. A system of conservation tillage that leaves crop residue on the surface helps to control soil blowing. Returning crop residue to the soil or regularly adding other organic material improves fertility and maintains tilth.

A cover of pasture plants or hay helps to control soil blowing. Forage production is limited to those crop mixtures that are tolerant of the wetness. An example of such a mixture is birdsfoot trefoil and orchardgrass or red clover and timothy. Restricting grazing and equipment use during wet periods minimizes compaction and thus helps to maintain tilth and productivity. Pasture rotation is beneficial.

The land capability classification is IIw.

420B—Tama silty clay loam, benches, 2 to 5 percent slopes. This gently sloping, well drained soil is in broad, terracelike positions. Areas range from 10 to more than 20 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, friable silty clay loam about 8 inches thick. The subsurface layer is very dark brown and dark brown, friable silty clay loam about 11 inches thick. The subsoil to a depth of about 60 inches is mottled, friable silty clay loam. The upper part is brown, and the lower part is mottled brown and dark grayish brown. In some places the surface layer is dark brown and very dark grayish brown. In other places sand is at a depth of 5 to 8 feet.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 3 to 4 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. It can be controlled, however, by contour farming, a system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping. In most areas slopes are long enough and uniform enough for terracing. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, and

timely deferment of grazing help to keep the pasture in good condition.

The land capability classification is IIe.

426B—Aredale silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on ridgetops and side slopes in the uplands. Areas generally range from 5 to 30 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, friable silt loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 6 inches thick. The subsoil is about 42 inches thick. The upper part is dark yellowish brown and yellowish brown, friable loam; the next part is yellowish brown, friable sandy loam; and the lower part is yellowish brown, firm loam. The substratum to a depth of about 60 inches is yellowish brown and dark grayish brown loam.

Included with this soil in mapping are a few small areas of soils that have a sandy surface layer. These soils are droughty and are on convex knobs. They make up about 5 to 10 percent of the unit.

Permeability of this Aredale soil is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is about 3 to 4 percent. The subsoil generally has a very low supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. It can be controlled, however, by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include hay or pasture. If terraces are built, cuts should not expose the less productive subsoil. Returning crop residue to the surface or regularly adding other organic material improves fertility, helps to maintain good tilth, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIe.

426C—Aredale silt loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on ridgetops and short side slopes in the uplands. Areas range from 5 to 20 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is very dark brown silt loam about 6 inches thick. The subsoil is about 44 inches thick. The upper part is yellowish brown, mottled silt loam; the next part is yellowish brown, mottled loam, clay loam, loamy sand, and sandy loam; and the lower part is yellowish brown loam. The substratum to a depth of about 60 inches is yellowish brown and grayish brown loam.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 3 to 4 percent. The subsoil generally has a very low supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. It can be controlled, however, by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. If terraces are built, cuts should not expose the less productive underlying sandy material and glacial till. Returning crop residue to the soil or regularly adding other organic material and deferring tillage when the soil is wet help to maintain tilth, improve fertility, prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing causes surface compaction and poor tilth, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby increases the tilth and fertility of the soil.

The land capability classification is IIIe.

426C2—Aredale silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is on ridgetops and convex side slopes in the uplands. Areas range from 10 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silt loam about 7 inches thick. It is mixed with streaks and pockets of material from the subsoil. The subsoil extends to a depth of at least 60 inches. The upper part is yellowish brown, mottled, friable silt loam; the next part is yellowish brown, mottled, friable loam, loamy sand, and loam; and the lower part is yellowish brown, firm clay loam.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 2.5 to 3.5 percent. The

subsoil generally has a very low supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated. This soil is suited to corn, soybeans, and small grain and is well suited to grasses and legumes fo. hay and pasture. If cultivated crops are grown, further erosion is a hazard. It can be controlled, however, by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. If terraces are built, cuts should not expose the less productive underlying sandy material and glacial till. Returning crop residue to the soil or regularly adding other organic material and deferring tillage when the soil is wet help to maintain tilth, improve fertility, prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing causes surface compaction and poor tilth, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby increases the tilth and fertility of the soil.

The land capability classification is IIIe.

426D2—Aredale silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is on nose slopes and convex side slopes in the uplands. Areas range from 10 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. It is mixed with streaks and pockets of material from the subsoil. The subsoil is about 48 inches thick. The upper part is brown, friable silt loam, and the lower part is yellowish brown, friable, stratified loam and sandy loam. The substratum to a depth of about 60 inches is yellowish brown and grayish brown loam.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 2.5 to 3.5 percent. The subsoil generally has a very low supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a severe hazard. It can be controlled, however, by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. If terraces are built, cuts should not expose the less productive underlying sandy material and glacial till. Returning crop residue to the soil or regularly adding other organic material and deferring tillage when the soil is wet help to maintain tilth, improve fertility, prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing causes surface compaction and poor tilth, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby increases the tilth and fertility of the soil.

The land capability classification is IIIe.

428B—Ely silty clay loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is in long narrow bands at the bottom of hillsides and on alluvial fans where waterways empty into flood plains. Areas are elongated or irregular in shape and generally are 5 to 70 acres in size.

Typically, the surface layer is black, friable silty clay loam about 9 inches thick. The subsurface layer is black, very dark gray, and very dark grayish brown, friable silty clay loam about 20 inches thick. The upper part of the subsoil is brown, mottled, friable silty clay loam, and the lower part to a depth of about 60 inches is grayish brown and light brownish gray, mottled, friable silty clay loam and silt loam.

Permeability is moderate, and runoff is medium. Available water capacity is high. The seasonal high water table is at a depth of 2 to 4 feet. The content of organic matter is about 5 to 6 percent in the surface layer. The subsoil generally has a low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, contour farming, and terracing help to prevent excessive soil loss. In places contour farming and terracing are difficult because the slopes are short and irregular. A tile drainage system that intercepts seepage from adjacent slopes helps to overcome the wetness. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to maintain tilth.

A cover of pasture plants or hay helps to control erosion. Most forage species grow well on this soil. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation,

timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIe.

430—Ackmore silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on flood plains. It is occasionally flooded. Areas generally range from 5 to 50 acres in size but are as large as 100 acres. They are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silt loam about 7 inches thick. The substratum is very dark grayish brown and dark grayish brown, stratified silt loam about 20 inches thick. Below this to a depth of about 60 inches is a buried layer of black silty clay loam. In places silt loam extends to a depth of 40 inches.

Included with this soil in mapping are small areas of the poorly drained Colo soils. These soils are lower on the landscape than the Ackmore soil and dry out more slowly after periods of rainfall. Also, they have a higher content of organic matter. They make up less than 10 percent of the unit.

Permeability of this Ackmore soil is moderate, and runoff is slow. Available water capacity is very high. The seasonal high water table is at a depth of 1 to 3 feet. The content of organic matter in the surface layer is 1 to 3 percent. The substratum generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. A drainage system is needed to reduce the wetness and provide good aeration and a deep root zone for plants. Tile drains work well if they are properly installed and if an adequate outlet is available. Returning crop residue to the soil or regularly adding other organic material helps to maintain tilth, improve fertility, prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay helps to control soil blowing. Unless the soil is drained, forage production is limited to those crop mixtures that are tolerant of the wetness. An example of such a mixture is birdsfoot trefoil and tall fescue or red clover and timothy. Restricting grazing and equipment use during wet periods minimizes compaction and thus helps to maintain tilth and productivity. Pasture rotation is beneficial.

The land capability classification is IIw.

430B—Ackmore silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is in upland drainageways. It is subject to flooding in the areas closest to the stream. Areas generally range from 5 to 50 acres in size but are as large as 100 acres. They are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silt loam about 7 inches thick. The substratum is very dark grayish brown and dark grayish brown, stratified silt loam about 20 inches thick. Below this to a depth of about 60 inches is a buried layer of black silty clay loam. In places silt loam extends to a depth of 40 inches or more.

Included with this soil in mapping are small areas of the poorly drained Colo soils. These soils are lower on the landscape than the Ackmore soil and dry out more slowly after periods of rainfall. Also, they have a higher content of organic matter. They make up less than 10 percent of the unit.

Permeability of this Ackmore soil is moderate, and runoff is medium. Available water capacity is high. The seasonal high water table is at a depth of 1 to 3 feet. The content of organic matter in the surface layer is 1 to 3 percent. The substratum generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. A drainage system is needed to reduce the wetness and provide good aeration and a deep root zone for plants. Tile drains work well if they are properly installed and if an adequate outlet is available. Overwash and siltation from soils upslope are management concerns. Returning crop residue to the soil or regularly adding other organic material helps to maintain tilth, improve fertility, prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay helps to control soil blowing. Unless the soil is drained, forage production is limited to those crop mixtures that are tolerant of the wetness. An example of such a mixture is birdsfoot trefoil and tall fescue or red clover and timothy. Restricting grazing and equipment use during wet periods minimizes compaction and thus helps to maintain tilth and productivity. Pasture rotation is beneficial.

The land capability classification is IIw.

442C2—Tama, sandy substratum-Dickinson complex, 5 to 9 percent slopes, moderately eroded. These moderately sloping, well drained and somewhat excessively drained soils are on ridgetops and side slopes in the uplands. Many of the ridges are oriented from northwest to southeast. Areas range from 5 to 100 acres in size. They are about 50 percent Tama soil and 30 percent Dickinson soil. These soils occur as areas

so intricately mixed or so small that separating them in mapping is not practical.

Typically, the surface layer of the Tama soil is very dark brown, friable silty clay loam about 7 inches thick. It is mixed with streaks and pockets of brown material from the subsoil. The subsoil is friable silty clay loam about 38 inches thick. The upper part is brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is yellowish brown fine sand. In places sand is at a depth of 3 feet.

Typically, the surface layer of the Dickinson soil is very dark brown, very friable fine sandy loam about 8 inches thick. It is mixed with streaks and pockets of material from the subsoil. The subsoil is about 24 inches thick. The upper part is brown, very friable fine sandy loam, and the lower part is dark yellowish brown and yellowish brown, loose loamy sand. The substratum to a depth of about 60 inches is yellowish brown sand.

Included with these soils in mapping are soils that have a surface layer and subsoil of loamy sand and soils that are stratified silt loam, loam, and sandy loam. Included soils make up less than 20 percent of the unit.

Permeability is moderate in the subsoil of the Tama soil and rapid in the sandy substratum. It is moderately rapid in the Dickinson soil. Runoff is medium on both soils. Available water capacity is high in the Tama soil and low in the Dickinson soil. The content of organic matter is 2.2 to 3.2 percent in the surface layer of the Tama soil and 1.0 to 2.0 percent in the surface layer of the Dickinson soil. The subsoil of the Tama soil has a medium supply of available phosphorus and a very low supply of available potassium. The subsoil of the Dickinson soil has a very low supply of available phosphorus and potassium.

Most areas are cultivated. These soils are moderately suited to corn, soybeans, and small grain and are well suited to grasses and legumes for hay and pasture. The Dickinson soil is droughty and is subject to soil blowing. Newly seeded crops on these soils and on adjacent soils are sometimes damaged by blowing sand from the Dickinson soil if the soils are not protected by a vegetative cover. A system of conservation tillage that leaves crop residue on the surface and cover crops help to prevent excessive soil loss. Contour farming is beneficial in places. Terraces are difficult to construct and to maintain. Returning crop residue to the soils or regularly adding other organic material improves fertility and helps to maintain tilth.

A cover of hay or pasture plants helps to control water erosion and soil blowing. Overgrazing or grazing when the soils are wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIIe.

442D2—Tama, sandy substratum-Dickinson complex, 9 to 14 percent slopes, moderately eroded. These strongly sloping, well drained and somewhat excessively drained soils are on side slopes in the uplands. Areas range from 5 to 20 acres in size. They are about 50 percent Tama soil and 30 percent Dickinson soil. These soils occur as areas so intricately mixed or so small that separating them in mapping is not practical.

Typically, the surface layer of the Tama soil is very dark grayish brown, friable silty clay loam about 7 inches thick. It is mixed with streaks and pockets of brown material from the subsoil. The subsoil is friable silty clay loam about 36 inches thick. The upper part is brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is yellowish brown fine sand. In places sand is within a depth of 3 feet.

Typically, the surface layer of the Dickinson soil is very dark brown, very friable fine sandy loam about 6 inches thick. It is mixed with streaks and pockets of material from the subsoil. The subsoil is about 24 inches thick. The upper part is brown, very friable fine sandy loam, and the lower part is dark yellowish brown and yellowish brown, loose loamy sand. The substratum to a depth of about 60 inches is yellowish brown sand.

Included with these soils in mapping are soils that have a surface layer and subsoil of loamy sand and soils that are stratified silt loam, loam, and sandy loam. Included soils make up less than 20 percent of the unit.

Permeability is moderate in the subsoil of the Tama soil and rapid in the sandy substratum. It is moderately rapid in the Dickinson soil. Runoff is rapid on the Tama soil and medium on the Dickinson soil. Available water capacity is high in the Tama soil and low in the Dickinson soil. The content of organic matter is 2.2 to 3.2 percent in the surface layer of the Tama soil and 1.0 to 2.0 percent in the surface layer of the Dickinson soil. The subsoil of the Tama soil has a medium supply of available phosphorus and a very low supply of available potassium. The subsoil of the Dickinson soil has a very low supply of available phosphorus and potassium.

Most areas are cultivated. These soils are poorly suited to corn, soybeans, and small grain and are moderately suited to grasses and legumes for hay and pasture. The Dickinson soil is droughty and is subject to soil blowing. Newly seeded crops on these soils and on adjacent soils are sometimes damaged by blowing sand from the Dickinson soil if the soils are not protected by

a vegetative cover. A system of conservation tillage that leaves crop residue on the surface and cover crops help to prevent excessive soil loss. Contour farming is beneficial in places. Terraces are difficult to construct and maintain. Returning crop residue to the soils or regularly adding other organic material improves fertility and helps to maintain tilth.

A cover of hay or pasture plants helps to control water erosion and soil blowing. Overgrazing or grazing when the soils are wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IVe.

442E2—Tama, sandy substratum-Dickinson complex, 14 to 18 percent slopes, moderately eroded. These moderately steep, well drained and somewhat excessively drained soils are on side slopes in the uplands. Areas range from 5 to 20 acres in size. They are about 50 percent Tama soil and 30 percent Dickinson soil. These soils occur as areas so intricately mixed or so small that separating them in mapping is not practical.

Typically, the surface layer of the Tama soil is very dark brown, friable silty clay loam about 8 inches thick. It is mixed with streaks and pockets of material from the subsoil. The subsoil is friable silty clay loam about 36 inches thick. The upper part is brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown fine sand. In places sand is at a depth of 3 feet.

Typically, the surface layer of the Dickinson soil is dark brown, very friable fine sandy loam about 6 inches thick. It is mixed with streaks and pockets of material from the subsoil. The subsoil is about 20 inches thick. The upper part is brown, very friable fine sandy loam, and the lower part is dark yellowish brown and yellowish brown, loose loamy sand. The substratum to a depth of about 60 inches is yellowish brown sand.

Included with these soils in mapping are soils that have a surface layer and subsoil of loamy sand and soils that are stratified silt loam, loam, and sandy loam. Included soils make up less than 20 percent of the unit.

Permeability is moderate in the subsoil of the Tama soil and rapid in the sandy substratum. It is moderately rapid in the Dickinson soil. Runoff is rapid on the Tama soil and medium on the Dickinson soil. Available water capacity is high in the Tama soil and low in the Dickinson soil. The content of organic matter is 2.2 to 3.2 percent in the surface layer of the Tama soil and 1.0 to 2.0 percent in the surface layer of the Dickinson soil. The subsoil in the Tama soil has a medium supply of available phosphorus and a very low supply of available potassium. The subsoil of the Dickinson soil has a very low supply of available phosphorus and potassium.

Most areas are cultivated. These soils are unsuited to cultivated crops because of the slope. They are moderately suited to grasses and legumes for hay and pasture. Operating farm machinery is difficult because of the slope. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture.

A cover of hay and pasture plants helps to control water erosion and soil blowing. Overgrazing or grazing when the soils are wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IVe.

450B—Pillot silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on convex ridgetops in the uplands. Areas range from 5 to 60 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is about 25 inches thick. The upper part is dark yellowish brown, friable silt loam; the next part is dark yellowish brown, brown, and yellowish brown, friable silty clay loam; and the lower part is brown, very friable loamy sand. The substratum to a depth of about 60 inches is pale brown sand. In places the depth to sand is more than 60 inches.

Included with this soil in mapping are scattered areas of soils that have sand within a depth of 20 inches. These soils are more droughty than the Pillot soil. They make up 5 to 10 percent of the unit.

Permeability is moderate in the upper part of this Pillot soil and rapid in the lower part. Runoff is medium. Available water capacity is moderate. The content of organic matter in the surface layer is 3 to 4 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a hazard. It can be controlled by contour farming and a system of conservation tillage that leaves crop residue on the surface. In places contour farming and terracing are difficult because the slopes are short and irregular. If terraces are built, deep cuts should not be made because coarse textured material is below a depth of 3

feet. The soil puddles if worked when wet and crusts after hard rains. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is well suited to grasses and legumes for hay and pasture. Most forage species grow well on this soil. A cover of hay or pasture plants helps to control erosion. Restricting grazing and equipment use during wet periods minimizes compaction and thus helps to maintain tilth and control runoff.

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

The land capability classification is IIe.

450C2—Pillot silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is on side slopes in the uplands. Areas range from 5 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is dark brown silt loam about 8 inches thick. It is mixed with streaks and pockets of material from the subsoil. The subsoil is about 32 inches thick. The upper part is dark yellowish brown and yellowish brown, friable silty clay loam, and the lower part is yellowish brown, very friable loamy sand. The substratum to a depth of about 60 inches is yellowish brown and pale brown sand. In some places the depth to sand is more than 60 inches. In other places the surface layer is lighter colored and has a lower content of organic matter.

Included with this soil in mapping are scattered areas of soils that have sand within a depth of 20 inches. These soils are more droughty than the Pillot soil. They make up 5 to 10 percent of the unit.

Permeability is moderate in the upper part of this Pillot soil and rapid in the lower part. Runoff is medium. Available water capacity is moderate. The content of organic matter in the surface layer is 2.5 to 3.5 percent. The subsoil generally has a medium supply of available phosphorus and very low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, erosion is a severe hazard. A system of conservation tillage that leaves crop residue on the surface and contour farming reduce soil loss. In places contour farming and terracing are difficult because the slopes are short and irregular. If terraces are built, deep cuts should not be made because coarse textured material is below a depth of 3 feet. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

A cover of pasture plants or hay helps to control erosion. Most forage crops grow well on this soil. Restricting grazing and equipment use during wet periods minimizes compaction and thus helps to maintain tilth and control runoff. Improved permanent pasture increases the content of organic matter. Pasture rotation is beneficial.

The land capability classification is IIIe.

484—Lawson silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on flood plains along rivers and streams. It is subject to flooding. Areas generally range from 10 to 50 acres in size, but a few are about 100 acres in size. The areas are elongated or irregularly shaped.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is black and very dark gray, friable silt loam about 27 inches thick. The substratum to a depth of about 60 inches is stratified very dark gray, black, and dark grayish brown silt loam. In places the soil has a higher content of sand.

Included with this soil in mapping are small areas of the poorly drained Colo soils. These soils make up about 5 to 10 percent of the unit.

Permeability of this Lawson soil is moderate, and runoff is slow. Available water capacity is high. The seasonal high water table is at a depth of 1 to 3 feet. The content of organic matter in the surface layer is about 4.5 to 6.0 percent. The surface layer generally has a medium supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated or used for hay and pasture. Some support trees. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Cultivated crops can be grown in most years. The flooding generally is brief. In many places diversion terraces on adjacent foot slopes help to control runoff from the higher areas. Good tilth generally can be easily maintained. Returning crop residue to the soil and delaying fieldwork when the soil is wet help to maintain tilth and improve fertility.

Pasture management can be difficult because of the flooding. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods or following periods of flooding help to keep the pasture in good condition. Permanent pasture can be improved by renovating and reseeding.

The land capability classification is IIw.

499G—Nordness silt loam, 18 to 40 percent slopes. This steep and very steep, well drained soil is on short side slopes and escarpments in the uplands. Areas range from 5 to 20 acres in size and are long and narrow.

Typically, the surface layer is very dark grayish

brown, friable silt loam about 4 inches thick. The subsurface layer is brown, friable silt loam about 2 inches thick. The subsoil is about 8 inches thick. It is brown and friable. The upper part is silty clay loam, and the lower part is clay loam. Fractured limestone bedrock is at a depth of about 14 inches.

Included with this soil in mapping are areas of Fayette and Lindley soils. These soils are in landscape positions similar to those of the Nordness soil. They do not have limestone bedrock within a depth of 48 inches. Also included are outcrops of limestone bedrock. Included areas make up about 10 to 15 percent of the unit.

Permeability of this Nordness soil is moderate, and runoff is very rapid. Available water capacity is very low. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a very low supply of available phosphorus and a low supply of available potassium.

Most areas are used as woodland or for wildlife habitat. Some small areas are used as permanent pasture. This soil is unsuited to cultivated crops because of the depth to bedrock, the slope, and a severe hazard of erosion. It is poorly suited to grasses and legumes for hay and pasture. It is extremely limited as a site for other agricultural uses. Renovating pasture is difficult because of the depth to bedrock. Ordinary farm machinery cannot be used because slabs of limestone are at the surface of the soil and the slope generally is too steep. The number of livestock that can graze the pasture without damaging the plant cover is low. As a result, controlled grazing is needed.

The land capability classification is VIIs.

539—Perks sandy loam, 0 to 3 percent slopes. This very gently sloping, excessively drained soil is on flood plains. It is subject to flooding. Areas generally range from 25 to 150 acres in size and are elongated.

Typically, the surface layer is dark brown, very friable sandy loam about 4 inches thick. The substratum to a depth of about 60 inches is dark yellowish brown and yellowish brown sand. In some places the surface layer is loamy sand, and in other places it is sand.

Permeability is moderately rapid, and runoff is slow. Available water capacity is very low. The content of organic matter in the surface layer is about 1.5 to 2.5 percent. The subsoil generally has a very low supply of available phosphorus and potassium.

Most areas are cultivated. If adequately protected from flooding, this soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. Levees and dikes help to control the floodwater. Good tilth generally can be easily maintained.

Areas of this soil are easily overstocked because the soil is droughty and, at some times of the year, may not be able to produce a good stand of vegetation. The soil is suited to most forage crops. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

The land capability classification is IIIs.

673D3—Timula silt loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, well drained soil is on short, convex side slopes in the uplands. The slopes are dissected by many small drainageways. Areas range from 10 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. It is mixed with streaks and pockets of dark brown material from the original surface layer. The subsoil is friable, mottled silt loam about 30 inches thick. The upper part is dark yellowish brown, and the lower part is grayish brown and calcareous. The substratum to a depth of about 60 inches is light brownish gray, mottled, calcareous silt loam that has large accumulations of iron oxide. In places the subsoil is grayish brown throughout.

Permeability is moderate, and runoff is rapid. Available water capacity is very high. The content of organic matter in the surface layer is 0.5 to 2.0 percent. The subsoil generally has a medium supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated. Some are used as pasture or woodland. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a serious hazard. A system of conservation tillage that leaves crop residue on the surface, contour farming, stripcropping, and grassed waterways help to prevent excessive soil loss. The soil generally is not well suited to terracing because the slopes are short and complex and the subsoil is very erodible if it is exposed by deep cuts. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration. More nitrogen generally is needed on this soil than on less eroded soils upslope. Also, more intense management is needed to improve tilth.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Reseeding may be difficult because the organic matter content is low. Overgrazing or trampling by cattle and operating equipment in areas of this soil reduce the extent of the protective plant cover and increase the

rate of runoff. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in fairly good condition. Improved permanent pasture increases the content of organic matter and thereby improves the quality of the stand and the fertility of the soil.

The land capability classification is IVe.

673E3—Timula silt loam, 14 to 18 percent slopes, severely eroded. This moderately steep, well drained soil is in coves along upland drainageways and on short, convex side slopes in the uplands. The slopes have been dissected by many small waterways. Areas range from 5 to 15 acres in size and are irregularly shaped.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. It is mixed with streaks and pockets of dark brown material from the original surface layer. The subsoil is friable, mottled silt loam about 28 inches thick. The upper part is brown and yellowish brown, and the lower part is grayish brown and calcareous. The substratum to a depth of about 60 inches is grayish brown, mottled, calcareous silt loam that has large accumulations of iron oxide. In places the substratum is brown loam.

Permeability is moderate, and runoff is rapid. Available water capacity is very high. The content of organic matter in the surface layer is 0.5 to 2.0 percent. The subsoil generally has a medium supply of available phosphorus and a low supply of available potassium.

Most areas are cultivated. Some are used as pasture or woodland. This soil is unsuited to cultivated crops because further erosion is a serious hazard. It is moderately suited to grasses and legumes for hay and pasture. Cultivated crops should be grown only to help reestablish hay and pasture. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet.

A cover of pasture plants or hay helps to control erosion. Reseeding may be difficult because the organic matter content is low. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby increases the quality of the pasture and the fertility of the soil.

The land capability classification is VIe.

673F3—Timula silt loam, 18 to 25 percent slopes, severely eroded. This steep, well drained soil is on short, convex side slopes in the uplands. The slopes have been dissected by many small waterways and gullies. Areas range from 5 to 30 acres in size and are elongated.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. It is mixed with streaks and pockets of dark brown material from the original surface layer. The subsoil is friable, mottled silt loam about 36 inches thick. The upper part is dark yellowish brown, and the lower part is grayish brown and calcareous. The substratum to a depth of about 60 inches is light brownish gray, mottled, calcareous silt loam that has large accumulations of iron oxide. In some places the upper part of the substratum is grayish brown. In other places the lower part of the substratum is yellowish brown loam.

Permeability is moderate, and runoff is very rapid. Available water capacity is very high. The content of organic matter in the surface layer is 0.5 to 2.0 percent. The subsoil generally has a medium supply of available phosphorus and low supply of available potassium.

Many areas are cultivated. Some are pastured. This soil is unsuited to cultivated crops and is only moderately suited to grasses and legumes for hay and pasture, mainly because further erosion is a serious hazard. Operating farm machinery is difficult because of the slope and the gullies and waterways. Cultivated crops should be grown only to help reestablish pasture and hay.

A cover of pasture plants or hay helps to control erosion. Reseeding may be difficult because the organic matter content is low. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the tilth and fertility of the soil.

The land capability classification is VIe.

763E3—Exette silt loam, 14 to 18 percent slopes, severely eroded. This moderately steep, well drained soil is in coves along upland drainageways and on convex side slopes in the uplands. Areas range from 10 to 40 acres in size and are elongated.

Typically, the surface layer is mixed brown and yellowish brown, friable silt loam about 8 inches thick.

The subsoil is brown and yellowish brown, mottled, friable silt loam about 38 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled silt loam. In places the subsoil is yellowish brown throughout.

Permeability is moderate, and runoff is rapid. Available water capacity is very high. The content of organic matter in the surface layer is 0.5 to 2.0 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. Some are used as pasture or woodland. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If cultivated crops are grown, severe erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, contour farming, stripcropping, grassed waterways, and a cropping sequence that includes grasses and legumes help to prevent excessive soil loss. The soil generally is not suited to terracing because the slopes are too steep and are short and complex. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Reseeding may be difficult because the organic matter content is low. Overgrazing or trampling by cattle and operating equipment in areas of this soil reduce the extent of the protective plant cover and increase the rate of runoff, resulting in an increased hazard of erosion. Gullying is a severe hazard along livestock trails. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the tilth and fertility of the soil.

The land capability classification is VIe.

763F3—Exette silt loam, 18 to 25 percent slopes, severely eroded. This steep, well drained soil is in coves along upland drainageways and on short, convex side slopes. The slopes are dissected by many small waterways in the uplands. Areas range from 5 to 10 acres in size and are elongated.

Typically, the surface layer is brown and yellowish brown, friable silt loam about 6 inches thick. It is mixed with streaks and pockets of material from the subsoil. The subsoil is brown and yellowish brown, mottled, friable silt loam about 36 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled silt loam. In places the subsoil is yellowish brown throughout.

Permeability is moderate, and runoff is very rapid. Available water capacity is very high. The content of organic matter in the surface layer is 0.5 to 2.0 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. Some are pastured. This soil is unsuited to cultivated crops and is only moderately suited to hay because further erosion is a serious hazard. Operating farm machinery is difficult because of the slope and the many small waterways. Cultivated crops should be grown only to help reestablish hay and pasture. Tilth generally is poor in the surface layer.

A cover of pasture plants helps to control erosion. Reseeding may be difficult because the organic matter content is low. Overgrazing or trampling by cattle and operating equipment in areas of this soil reduce the extent of the protective plant cover and increase the rate of runoff. Gullying is a severe hazard along livestock trails. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in fairly good condition.

The land capability classification is VIe.

767E3—Mula silt loam, 14 to 18 percent slopes, severely eroded. This moderately steep, well drained soil is on short, convex side slopes in the uplands. Areas range from 10 to 40 acres in size and are elongated.

Typically, the surface layer is brown, friable, calcareous silt loam about 5 inches thick. About 10 to 15 percent of the surface layer is streaks and pockets of dark brown material from the original surface layer. The subsoil is grayish brown and yellowish brown, mottled, friable, calcareous silt loam about 18 inches thick. The substratum to a depth of about 60 inches is brown, calcareous, mottled silt loam.

Permeability is moderate, and runoff is rapid. Available water capacity is very high. The organic matter content in the surface layer is 0.5 to 2.0 percent. The subsoil generally has a low supply of available phosphorus and potassium.

Most areas are cultivated. Some are used as pasture or woodland. This soil is poorly suited to corn, soybeans, and small grain and is moderately suited to grasses and legumes for hay and pasture. If cultivated crops are grown, severe erosion is a hazard. A system of conservation tillage that leaves crop residue on the

surface, contour farming, stripcropping, grassed waterways, and a cropping sequence that includes grasses and legumes help to prevent excessive soil loss. The soil generally is not suited to terracing because the slopes are too steep, short, and complex. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Reseeding may be difficult because the organic matter content is low. Overgrazing or trampling by cattle and operating equipment in areas of this soil reduce the extent of the protective plant cover and increase the rate of runoff. Gullying is a severe hazard along livestock trails. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in fairly good condition. Improved permanent pasture increases the content of organic matter and thereby improves the tilth and fertility of the soil.

The land capability classification is VIe.

767F3—Mula silt loam, 18 to 25 percent slopes, severely eroded. This steep, well drained soil is on short, convex side slopes in the uplands. Areas range from 5 to 25 acres in size and are elongated.

Typically, the surface layer is brown, calcareous, friable silt loam about 5 inches thick. It is mixed with streaks and pockets of dark brown material from the original surface layer. The subsoil is grayish brown and yellowish brown, friable, calcareous silt loam about 18 inches thick. The substratum to a depth of about 60 inches is brown, calcareous, mottled silt loam. The lower part of the substratum has large, yellowish red accumulations of iron. In places the lower part of the substratum is yellowish brown loam.

Permeability is moderate, and runoff is very rapid. Available water capacity is very high. The content of organic matter in the surface layer is 0.5 to 2.0 percent. The subsoil generally has a low supply of available phosphorus and potassium.

Many areas are cultivated. Some are pastured. This soil is unsuited to cultivated crops and is only moderately suited to grasses and legumes for pasture and hay, mainly because further erosion is a serious hazard. Operating farm machinery is difficult because of the slope and the many small waterways. Cultivated crops should be grown only to help reestablish hay and pasture.

A cover of pasture plants or hay helps to control erosion. Reseeding may be difficult because the organic matter content is low. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the runoff rate. Gullying is a severe hazard along livestock trails. Species that can withstand trampling by livestock should be selected for planting. Examples of such species are tall fescue and orchardgrass. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves tilth and fertility of the soil.

The land capability classification is VIe.

814—Rockton loam, 0 to 3 percent slopes. This nearly level to gently sloping, well drained soil is in benchlike positions, generally along the Mississippi River. Areas generally are 5 to 25 acres in size and are irregularly shaped.

Typically, the surface layer is black, friable loam about 10 inches thick. The subsurface layer is very dark brown and dark brown, friable loam about 11 inches thick. The subsoil is brown, friable sandy clay loam about 13 inches thick. Limestone bedrock is at a depth of about 34 inches. In a few places fragments of limestone bedrock are near or on the surface.

Permeability is moderate, and runoff is slow. Available water capacity is low or moderate. The content of organic matter in the surface layer is 3.5 to 4.5 percent. The subsoil generally has a very low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is moderately suited to corn and soybeans and is well suited to small grain and to grasses and legumes for hay and pasture. If row crops are grown year after year, erosion is a slight hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface. Good tilth generally can be easily maintained. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control soil blowing. This soil is suited to most forage crops. Overgrazing causes surface compaction and poor tilth, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

The land capability classification is IIs.

820—Dockery silt loam, 0 to 2 percent slopes. This level and nearly level, somewhat poorly drained soil is on flood plains. It is subject to flooding. Areas range

from 5 to 30 acres in size and are long and narrow.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The substratum is stratified very dark grayish brown, dark grayish brown, dark brown, and brown, mottled silt loam about 41 inches thick. Below this to a depth of about 60 inches is a buried layer of very dark brown silty clay loam. In places the surface layer is dark brown or very dark grayish brown.

Included with this soil in mapping are small areas of the poorly drained Colo soils. These soils generally are closer to the center of the drainageways than the Dockery soil. They dry out more slowly after periods of rainfall than the Dockery soil and have a higher content of organic matter. They make up less than 10 percent of the unit.

Permeability is moderate, and runoff is slow. Available water capacity is very high. The content of organic matter in the surface layer is 1.5 to 2.5 percent. The seasonal high water table is at a depth of 2 to 3 feet. The substratum generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. A drainage system is needed to reduce the wetness and provide good aeration and a deep root zone for plants. Tile drains work well if they are properly installed and if an adequate outlet is available. The soil is subject to overwash and siltation from soils upslope. Returning crop residue to the soil or regularly adding other organic material helps to maintain tilth, improve fertility, prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Forage crop mixtures should be limited to those that are tolerant of the wetness. An example of such a mixture is birdsfoot trefoil and orchardgrass or red clover and timothy. Restricting grazing and equipment use during wet periods minimizes compaction of the soil and damage to the vegetation and thus helps to maintain tilth and productivity. Pasture rotation is beneficial.

The land capability classification is IIw.

820B—Dockery silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is in upland drainageways. It is subject to flooding. Areas range from 5 to 50 acres in size and are long and narrow.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The substratum is stratified very dark grayish brown, dark grayish brown, dark brown, and brown, mottled silt loam about 41 inches thick. Below this to a depth of about 60 inches is a buried layer of very dark brown silty clay loam.

Permeability is moderate, and runoff is medium. The seasonal high water table is at a depth of 2 to 3 feet. Available water capacity is very high. The content of organic matter in the surface layer is 1.5 to 2.5 percent. The substratum generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. A drainage system is needed to reduce the wetness and provide good aeration and a deep root zone for plants. Tile drains work well if they are properly installed and if an adequate outlet is available. The soil is subject to overwash and siltation from soils upslope. Returning crop residue to the soil or regularly adding other organic material helps to maintain tilth, improve fertility, prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. Forage crop mixtures should be limited to those that are tolerant of the wetness. An example of such a mixture is birdsfoot trefoil and orchardgrass or red clover and timothy. Restricting grazing and equipment use during wet periods minimizes compaction of the soil and damage to the vegetation and thus helps to maintain tilth and productivity. Pasture rotation is beneficial.

The land capability classification is IIw.

826—Rowley silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on low stream terraces. It is subject to flooding. Areas range from 10 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is black and very dark grayish brown, friable silt loam about 15 inches thick. The subsoil is yellowish brown and light brownish gray, friable, mottled silt loam about 34 inches thick. The substratum to a depth of about 64 inches is brown fine sand.

Included with this soil in mapping are a few areas where the soils have been covered with 6 to 18 inches of lighter colored silty overwash from the adjacent uplands. These soils have a lower content of organic matter than the Rowley soil. They are near the base of the uplands and along drainage ditches. They make up less than 5 percent of the unit.

Permeability of this Rowley soil is moderate, and runoff is slow. The seasonal high water table is at a depth of 1 to 3 feet. Available water capacity is high. The content of organic matter in the surface layer is 4

to 5 percent. The subsoil generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. It is slightly wet, however, and receives runoff from the soils upslope. Establishing diversion terraces on those soils helps to protect this soil from overflow and siltation. A tile drainage system improves the timeliness of fieldwork. If row crops are grown year after year, erosion is a slight hazard. A system of conservation tillage that leaves crop residue on the surface, however, helps to prevent excessive soil loss. Good tilth generally can be easily maintained. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent surface crusting.

A cover of pasture plants or hay helps to control erosion. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the likelihood of puddling. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is I.

916B—Downs silt loam, sandy substratum, 2 to 5 percent slopes. This gently sloping, well drained soil is on ridges and side slopes in the uplands. It formed in 40 to 60 inches of loess and in the underlying sandy material. Areas range from 10 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 42 inches thick. It is friable. The upper part is brown silty clay loam; the next part is dark yellowish brown and yellowish brown silty clay loam; and the lower part is yellowish brown, mottled silt loam. The substratum to a depth of about 60 inches is yellowish brown fine sand. In places sand is at a depth of 3 feet.

Included with this soil in mapping are small areas of Atterberry soils in the less sloping areas at the head of drainageways. These soils have a grayer subsoil and are wetter than the Downs soil. They make up about 10 percent of the unit.

Permeability of this Downs soil is moderate in the silty material and rapid in the sandy material. Runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 2.5 to 3.5 percent. The subsoil generally has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping help to prevent excessive soil loss. Slopes commonly are long enough and uniform enough for terracing and contour farming. If terraces are built, deep cuts should not be made because the substratum is sandy. The soil tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage species. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIe.

916C2—Downs silt loam, sandy substratum, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is on narrow ridges and convex side slopes in the uplands. It formed in 40 to 60 inches of loess and in the underlying sandy material. Areas range from 5 to 30 acres in size and are irregularly shaped.

Typically, the surface layer is mixed very dark grayish brown and brown, friable silt loam about 8 inches thick. It is mixed with streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is about 40 inches thick. The upper part is brown silty clay loam, and the lower part is dark yellowish brown silt loam. The substratum to a depth of about 60 inches is dark yellowish brown and yellowish brown fine sand. In places sand is at a depth of 3 feet.

Permeability is moderate in the silty material and rapid in the sandy material. Runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is about 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping help to prevent excessive soil loss. Slopes commonly are long enough and uniform enough for terracing and contour farming. If terraces are built, deep cuts should not be made because the substratum is sandy. Tilth generally is fair in the surface layer. The

surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage species. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate and the likelihood of puddling. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIIe.

916D2—Downs silt loam, sandy substratum, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is on long, convex side slopes in the uplands. It formed in 40 to 60 inches of loess and in the underlying sandy material. Areas range from 5 to 30 acres in size and are elongated.

Typically, the surface layer is very dark grayish brown and brown silt loam about 8 inches thick. It is mixed with streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is about 34 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown fine sand. In places sand is within a depth of 3 feet.

Permeability is moderate in the silty material and rapid in the sandy material. Runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping help to prevent excessive soil loss. Slopes commonly are long enough and uniform enough for terracing and contour farming. If terraces are built, deep cuts should not be made because the substratum is sandy. If the soil is cultivated, the surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage species. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Improved permanent pasture increases the content of organic matter and thereby improves the tilth and fertility of the soil.

The land capability classification is IIIe.

920B—Tama silty clay loam, sandy substratum, 2 to 5 percent slopes. This gently sloping, well drained soil is on broad, convex ridges and side slopes in the uplands. It formed in 40 to 60 inches of loess and in the underlying sandy material. Areas range from 10 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, friable silty clay loam about 9 inches thick. The subsurface layer is very dark brown and dark brown, friable silty clay loam about 10 inches thick. The subsoil is friable silty clay loam about 37 inches thick. The upper part is brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown fine sand. In places sand is within a depth of 3 feet.

Included with this soil in mapping are small areas of Muscatine soils on the more level slopes. These soils have a subsoil that is grayer than that of the Tama soil. They also are wetter. They make up less than 10 percent of the unit.

Permeability of this Tama soil is moderate in the silty material and rapid in the sandy material. Runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is about 3 to 4 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping help to prevent excessive soil loss. Slopes commonly are long enough and uniform enough for terracing and contour farming. If terraces are built, deep cuts should not be made because the substratum is sandy. The soil tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops.

Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

The land capability classification is IIe.

920C2—Tama silty clay loam, sandy substratum, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is on narrow ridges and convex side slopes in the uplands. It formed in 40 to 60 inches of loess and in the underlying sandy material. Areas range from 5 to 30 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, friable silty clay loam about 7 inches thick. It is mixed with streaks and pockets of brown material from the subsoil. The subsoil is friable silty clay loam about 38 inches thick. The upper part is brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is yellowish brown fine sand. In places sand is within a depth of 3 feet.

Permeability is moderate in the silty material and rapid in the sandy material. Runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is about 2 to 3 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping help to prevent excessive soil loss. Slopes commonly are long enough and uniform enough for terracing and contour farming. If terraces are built, deep cuts should not be made because the substratum is sandy. Tilth generally is fair in the surface layer. The surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate and the likelihood of puddling. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIIe.

920D2—Tama silty clay loam, sandy substratum, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is on narrow ridges and convex side slopes in the uplands. It formed in 40 to 60 inches of loess and in the underlying sandy material. Areas range from 5 to 30 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, friable silty clay loam about 7 inches thick. It is mixed with streaks and pockets of brown material from the subsoil. The subsoil is friable silty clay loam about 36 inches thick. The upper part is brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is yellowish brown fine sand. In places sand is within a depth of 3 feet.

Permeability is moderate in the silty material and rapid in the sandy material. Runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface, grassed waterways, and stripcropping help to prevent excessive soil loss. Slopes generally are long enough and uniform enough for terracing and contour farming, but some may be too short for these practices. If terraces are built, deep cuts should not be made because the substratum is sandy. Tilth generally is fair in the surface layer. The surface layer tends to crust after hard rains and puddle if tilled when wet. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control erosion. This soil is suited to most forage crops. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and increases the runoff rate and the likelihood of puddling. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIIe.

926—Canoe silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on low stream terraces. It is subject to flooding. Areas range from 10 to 30 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The

subsurface layer is dark grayish brown and brown, friable silt loam about 15 inches thick. The subsoil is grayish brown, mottled, friable silty clay loam about 31 inches thick. The substratum to a depth of about 60 inches is yellowish brown silt loam. In places silt loam or silty clay loam extends to a depth of more than 60 inches.

Included with this soil in mapping are a few areas where the soils have been covered with 6 to 18 inches of lighter colored silty overwash from the adjacent uplands. These soils have a lower content of organic matter than the Canoe soil. They are near the base of uplands and along drainage ditches. They make up less than 5 percent of the unit.

Permeability of this Canoe soil is moderate, and runoff is slow. The seasonal high water table is at a depth of 2 to 4 feet. Available water capacity is very high. The content of organic matter in the surface layer is 2.5 to 3.5 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. It is slightly wet, however, and receives runoff from the soils upslope. Establishing diversion terraces on those soils helps to protect this soil from overflow and siltation. A tile drainage system improves the timeliness of fieldwork. If row crops are grown year after year, erosion is a slight hazard. A system of conservation tillage that leaves crop residue on the surface, however, helps to prevent excessive soil loss. Good tilth generally can be easily maintained. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent surface crusting.

A cover of pasture plants or hay helps to control erosion. Overgrazing or grazing when the soil is too wet causes surface compaction and increases the likelihood of puddling. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is I.

950—Niota silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on stream terraces and concave, low foot slopes. It is subject to ponding. Areas range from 5 to 30 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, mottled, friable silty clay loam about 8 inches thick. The subsoil to a depth of about 60 inches is mottled, firm clay. The upper part is dark gray, the next part is grayish brown, and the lower part is grayish brown and brown. In places, the surface soil is darker and the subsoil contains less clay.

Included with this soil in mapping are areas of soils that have loamy sand or sandy loam within a depth of 30 inches. These soils make up less than 5 percent of the unit.

Permeability of this Niota soil is very slow, and runoff is slow. The seasonal high water table is within a depth of 2 feet. Available water capacity is moderate or high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, a subsurface and surface drainage system is needed to reduce the wetness, provide aeration and a deep root zone for plants, and improve the timeliness of fieldwork. In most areas measures that help to control the runoff from nearby soils are needed. Tilth generally is fair or good in the surface layer.

A cover of pasture plants or hay helps to control soil blowing. Unless the soil is drained, forage production is limited to those crop mixtures that are tolerant of the wetness. An example of such a mixture is birdsfoot trefoil and tall fescue or red clover and timothy. Restricting grazing and equipment use during wet periods minimizes compaction and thus helps to maintain tilth and productivity. Pasture rotation is beneficial.

The land capability classification is IIIw.

950B—Niota silt loam, 2 to 5 percent slopes. This nearly level, poorly drained soil is on stream terraces. Areas range from 5 to 30 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, mottled, friable silty clay loam about 8 inches thick. The subsoil to a depth of about 60 inches is mottled, firm clay. The upper part is dark gray, the next part is grayish brown, and the lower part is grayish brown and brown. In places, the subsoil is reddish brown and yellowish brown and the soil is not so wet.

Permeability is very slow, and runoff is medium. The seasonal high water table is within a depth of 2 feet. Available water capacity is moderate or high. The content of organic matter in the surface layer is 2 to 3 percent. The subsoil generally has a low supply of available phosphorus and potassium.

Some areas are cultivated. A few are used for hay

and pasture. This soil is moderately suited to corn, soybeans, and small grain and is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, a subsurface and surface drainage system is needed to reduce the wetness, provide aeration and a deep root zone for plants, and improve the timeliness of fieldwork. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

Forage production should be limited to those crop mixtures that are tolerant of the wetness. An example of such a mixture is birdsfoot trefoil and tall fescue or red clover and timothy. Restricting grazing and equipment use during wet periods minimizes compaction of the soil and damage to the vegetation and thus helps to maintain tilth and productivity. Pasture rotation is beneficial.

The land capability classification is IIIw.

960—Shaffton loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on flood plains along the major rivers. It is subject to flooding, but some areas are protected. Areas range from 20 to 200 acres in size and are irregularly shaped.

Typically, the surface layer is black, friable loam about 9 inches thick. The subsurface layer is very dark grayish brown, friable loam about 13 inches thick. The subsoil is about 20 inches thick. It is brown, friable, mottled loam throughout. The substratum to a depth of about 60 inches is brown, mottled loam. In places, the surface layer is silty clay loam or clay loam and the soil dries out more slowly following periods of rainfall.

Permeability is moderate in the upper part of the profile and very rapid in the lower part. Runoff is slow. The seasonal high water table is at a depth of 2 to 4 feet. Available water capacity is moderate or high. The content of organic matter in the surface layer is about 2 to 3 percent. The surface layer generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Flooding is a hazard in areas that are not protected by levees and diversion ditches.

Pasture management can be difficult because of the flooding. Proper stocking rates, pasture rotation, and deferment of grazing during hot, dry periods help to keep the pasture in good condition. Permanent pasture can be improved by renovating and reseeding.

The land capability classification is IIw.

961—Ambraw clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on flood plains along streams and rivers. It is subject to flooding. Areas range from 10 to 50 acres in size and are irregularly shaped.

Typically, the surface layer is black, friable clay loam about 9 inches thick. The subsurface layer is black, firm clay loam about 12 inches thick. The subsoil is about 27 inches thick. It is friable. The upper part is dark gray, dark grayish brown, and brown, mottled clay loam; the next part is yellowish brown and dark grayish brown, mottled sandy clay loam; and the lower part is grayish brown, gray, and yellowish brown, mottled clay loam and sandy clay loam. The substratum extends to a depth of about 60 inches. The upper part is dark grayish brown and yellowish brown sandy loam that has dark gray mottles, and the lower part is strong brown and dark gray clay loam.

Permeability is moderately slow, and runoff is slow. Available water capacity is moderate or high. The seasonal high water table is within a depth of 2 feet. The content of organic matter in the surface layer is about 4 to 5 percent. The surface layer generally has a medium supply of available phosphorus and a very low supply of available potassium.

Some areas are cultivated. Some are used as woodland or for wildlife habitat. This soil is only moderately suited to corn, soybeans, and small grain because it is frequently flooded after periods of heavy rainfall. It is well suited to grasses and legumes for hay and pasture. In some areas diversion terraces are needed to help control runoff, and in other areas flood-control measures are needed. A tile drain system generally reduces the wetness if suitable outlets are provided. In places surface drains are needed to remove surface water. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

A cover of pasture plants or hay helps to control soil blowing. Unless the soil is drained, forage production is limited to those crop mixtures that are tolerant of the wetness. An example of such a mixture is birdsfoot trefoil and tall fescue or red clover and timothy. Restricting grazing and equipment use during wet periods minimizes compaction and thus helps to maintain tilth and productivity. Pasture rotation is beneficial.

The land capability classification is IIw.

977—Richwood silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on stream terraces along the major streams and rivers. Areas range from 10 to more than 200 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown, friable silt loam about 9 inches thick. The subsurface layer is

very dark grayish brown and dark brown, friable silt loam about 14 inches thick. The subsoil is dark yellowish brown, mottled, friable silt loam and silty clay loam about 35 inches thick. The substratum to a depth of about 65 inches is brown fine sand. In places loam is within a depth of 40 inches.

Permeability is moderate, and runoff is slow. Available water capacity is high. The content of organic matter in the surface layer is 3.5 to 4.5 percent. The surface layer generally has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. It occasionally receives local runoff from the soils upslope. Establishing diversion terraces on those soils helps to protect this soil from overflow and siltation. If row crops are grown year after year, erosion is a slight hazard. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface. Good tilth generally can be easily maintained. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

A cover of pasture plants or hay helps to control soil blowing. This soil is suited to most forage crops. Overgrazing causes surface compaction and poor tilth, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

The land capability classification is I.

1118—Garwin silty clay loam, benches, 0 to 2 percent slopes. This nearly level, poorly drained soil is on concave or flat slopes on broad stream benches that are covered with loess. Areas range from 5 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is black, friable silty clay loam about 9 inches thick. The subsurface layer is black, mottled, friable silty clay loam about 11 inches thick. The subsoil to a depth of about 60 inches is dark gray and grayish brown, mottled, friable silty clay loam. In places sand is at a depth of 5 to 8 feet.

Included with this soil in mapping are areas of the somewhat poorly drained Muscatine soils in the higher, convex landscape positions. These soils make up about 2 to 5 percent of the unit.

Permeability of this Garwin soil is moderate, and runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet. Available water capacity is high. The content of organic matter in the surface layer is 6 to 7 percent. The surface layer generally has a very low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. It is suited to intensively grown row crops, but a drainage system is needed for optimum crop production. It lowers the water table and thus improves the timeliness of fieldwork and provides aeration and a deep root zone for plants. A system of conservation tillage that leaves crop residue on the surface helps to control soil blowing. Returning crop residue to the surface or regularly adding other organic material improves fertility and helps to maintain tilth.

Forage production should be limited to those crop mixtures that are tolerant of the wetness. An example of such a mixture is birdsfoot trefoil and orchardgrass or red clover and timothy. Restricting grazing and equipment use during wet periods minimizes compaction of the soil and damage to the vegetation and thus helps to maintain tilth and productivity. Pasture rotation is beneficial.

The land capability classification is IIw.

1119—Muscatine silty clay loam, benches, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on broad stream benches that are covered with loess. Areas range from 10 to 30 acres in size and are irregularly shaped.

Typically, the surface layer is black, friable silty clay loam about 10 inches thick. The subsurface layer is very dark brown silty clay loam about 5 inches thick. The subsoil is friable silty clay loam about 39 inches thick. The upper part is dark grayish brown and mottled, and the lower part is grayish brown and mottled. The substratum to a depth of about 60 inches is grayish brown, mottled silty clay loam. In places, the surface layer is lighter colored, has a lower content of organic matter, and is thinner and the soil has sand at a depth of 5 to 8 feet.

Included with this soil in mapping are small areas of the poorly drained Garwin soils in the flatter areas and small areas of soils that are more sloping and subject to erosion. Included soils make up 5 to 10 percent of the unit.

Permeability of this Muscatine soil is moderate, and runoff is slow. The seasonal high water table is at a depth of 2 to 4 feet. Available water capacity is high. The content of organic matter in the surface layer is 5 to 6 percent. The surface layer generally has a low supply of phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Soil blowing is a hazard in intensively cultivated areas. A system of conservation

tillage that leaves crop residue on the surface helps to control soil blowing. Returning crop residue to the soil or adding other organic material improves fertility and helps to maintain tilth. A tile drainage system may be needed.

A cover of pasture plants or hay helps to control soil blowing. This soil has only slight limitations affecting the selection of productive forage species. Restricting grazing and equipment use during wet periods minimizes compaction of the soil and damage to the vegetation and thus helps to maintain tilth and productivity.

The land capability classification is I.

1539—Ambraw-Perks-Lawson complex, frequently flooded, 0 to 2 percent slopes. These nearly level soils are on broad flood plains along large streams and rivers. They are subject to flooding. The Ambraw soil is poorly drained, the Perks soil is excessively drained, and the Lawson soil is somewhat poorly drained. The landscape commonly is channeled and has low, natural levees, sloughs, and small oxbows. Areas range from 10 to more than 300 acres in size. They are about 40 percent Ambraw soil, 30 percent Perks soil, and 20 percent Lawson soil. These soils occur as areas so intricately mixed that mapping them separately is not practical.

Typically, the surface layer of the Ambraw soil is black, friable clay loam about 9 inches thick. The subsurface layer is black, firm clay loam about 12 inches thick. The subsoil is about 27 inches thick. It is friable. The upper part is dark gray, dark grayish brown, and brown, mottled clay loam; the next part is yellowish brown and dark grayish brown, mottled sandy clay loam; and the lower part is grayish brown, gray, and yellowish brown, mottled clay loam and sandy clay loam. The substratum extends to a depth of about 60 inches. The upper part is grayish brown and yellowish brown sandy loam that has dark gray mottles, and the lower part is strong brown and dark gray clay loam.

Typically, the surface layer of the Perks soil is dark brown, very friable sandy loam about 4 inches thick. The substratum to a depth of about 60 inches is brown, dark yellowish brown, and yellowish brown sand. In places the surface layer is sand.

Typically, the surface layer of the Lawson soil is black, friable silt loam about 8 inches thick. The subsurface layer is black and very dark gray, friable silt loam about 27 inches thick. The substratum to a depth of about 60 inches is stratified very dark gray, very dark grayish brown, black, and dark grayish brown silt loam. In places the soil has a higher content of sand.

Included with these soils in mapping are areas of somewhat poorly drained soils that are loamy throughout and areas of poorly drained soils that are silty clay loam throughout. Included soils make up about 10 percent of the unit.

Permeability is moderately slow in the Ambraw soil, moderate in the Lawson soil, and rapid in the Perks soil. Runoff is slow on all three soils. Available water capacity is moderate or high in the Ambraw soil, very low in the Perks soil, and very high in the Lawson soil. The Ambraw soil has a seasonal high water table within a depth of 2 feet, and the Lawson soil has a seasonal high water table at a depth of 1 to 3 feet. The content of organic matter is 4.0 to 5.0 percent in the surface layer of the Ambraw and Lawson soils and 1.5 to 2.5 percent in the surface layer of the Perks soil. The subsoil of the Ambraw and Lawson soils generally has a medium supply of available phosphorus and a very low supply of available potassium. The subsoil of the Perks soil generally has a very low supply of available phosphorus and potassium.

Most areas support native timber. Some small areas have been cleared of trees and leveled and are used for row crops. These soils are generally unsuited to corn, soybeans, and small grain and to hay because of the many old channels, sloughs, and oxbows.

These soils are moderately suited to grasses for pasture. Forage production may be low in areas of the Perks soil. A cover of pasture plants helps to control soil blowing. In most areas the suitable forage species are limited to those that are tolerant of the wetness. An example of such a mixture is orchardgrass and timothy. Managing the pasture is difficult. Restricted grazing during wet periods minimizes compaction of the soil and damage to the plant cover and thus helps to maintain tilth. Pasture rotation is beneficial.

These soils are well suited to trees. Because of the flooding, harvesting should be timely. Equipment should be used only during the drier periods or during the winter, when the ground is frozen. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. Planting larger or older nursery stock and mulching reduce the seedling mortality rate.

The land capability classification is Vw.

1730B—Nodaway-Perks complex, channeled, 0 to 5 percent slopes. These gently sloping, moderately well drained and excessively drained soils are on flood plains along small streams. They are subject to flooding. Areas range from 10 to 100 acres in size and are elongated. They are about 50 percent Nodaway soil and 40 percent Perks soil. These soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Nodaway soil is dark grayish brown, friable silt loam about 8 inches thick. The substratum to a depth of about 60 inches is dark grayish brown, brown, dark brown, and very dark grayish brown, stratified silt loam.

Typically, the surface layer of the Perks soil is dark brown, very friable fine sandy loam about 4 inches thick. The substratum to a depth of about 60 inches is stratified brown, dark yellowish brown, and yellowish brown sand.

Included with these soils in mapping are the poorly drained Colo soils. The surface layer and subsurface layer of the Colo soils is darker and thicker than that of the Nodaway and Perks soils. Included soils make up about 10 percent of the unit.

Permeability is moderate in the Nodaway soil and rapid in the Perks soil. Runoff generally is slow on both soils. The Nodaway soil has a seasonal high water table at a depth of 3 to 5 feet. Available water capacity is high or very high in the Nodaway soil and very low in the Perks soil. The content of organic matter is about 2.5 to 3.5 percent in the surface layer of the Nodaway soil and about 4.5 to 6.0 percent in the surface layer of the Perks soil. The substratum of the Perks soil generally has a very low supply of available phosphorus and potassium. The substratum of the Nodaway soil has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used as pasture or woodland or for wildlife habitat. These soils are unsuited to corn, soybeans, and small grain because of the meandering channel. They are only moderately suited to grasses and legumes for hay and pasture. Small areas of these soils may be cropped, but the flooding and wetness are management concerns.

Pasture management may be difficult because of the flooding. The meandering channel makes it difficult to use this unit for hay. Permanent pasture can be improved by reseeding and renovating. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods or following the flooding help to keep the pasture in good condition.

The land capability classification is Vw.

4000—Urban land. This map unit is on nearly level bottom land and on nearly level to gently sloping uplands and terraces in urban areas. Individual areas range from 10 to more than 50 acres in size and are rectangular or irregularly shaped.

This map unit is covered by streets, parking lots, buildings, shopping centers, and other structures that obscure or alter the soils so that identification of the soil series is not feasible. In many areas the structures are built on cut or fill material that ranges from 2 to more than 4 feet in thickness. Most areas are drained by sewer systems, gutters, and drainage tile.

No land capability classification is assigned.

4133—Colo-Urban land complex, 0 to 2 percent slopes. This map unit consists of intermingled areas of a nearly level, poorly drained Colo soil and areas of Urban land at the lower elevations on bottom land in and around the cities of Davenport and Bettendorf. It is subject to flooding. Areas range from 10 to more than 100 acres in size and are irregularly shaped. They are about 50 percent Colo soil, 40 percent Urban land, and 10 percent other soils. This soil and the Urban land occur as areas so intricately mixed or so small that mapping them separately is impractical.

Typically, the Colo soil has a surface layer of black, friable silty clay loam about 11 inches thick. The subsurface layer also is black, friable silty clay loam. It is about 20 inches thick. The subsoil to a depth of about 60 inches is friable, mottled silty clay loam. The upper part is very dark gray and dark gray, and the lower part is grayish brown.

The Urban land is covered by streets, parking lots, buildings, shopping centers, and other structures that obscure or alter the soils so that identification of the soil series is not feasible. It also includes exposed land that has been graded, filled, and reworked with earthmoving equipment so that the original soils no longer exist in the unit.

Permeability is moderate in the Colo soil, and runoff is slow. Available water capacity is high. The seasonal high water table is at a depth of 1 to 3 feet. The shrink-swell potential is high. The content of organic matter in the surface layer is 5 to 7 percent. The subsoil has a medium supply of available phosphorus and a very low supply of available potassium.

Properties of the Urban land vary. Most areas of this unit are drained by sewer systems, gutters, and drainage tile. Much of the unit has 2 to more than 4 feet of fill material over the original soils.

This map unit is suited to urban development. Onsite investigation is necessary to ensure that proper design and installation procedures have been followed.

No land capability classification is assigned.

4162C—Downs-Urban land complex, 2 to 9 percent slopes. This map unit consists of intermingled areas of a gently sloping and moderately sloping, well drained Downs soil and areas of Urban land on convex upland ridgetops and side slopes in and around the city of Davenport. Areas range from 5 to 200 acres in size and are irregularly shaped. They are about 50 percent Downs soil, 40 percent Urban land, and 10 percent other soils. This soil and the Urban land occur as areas

so intricately mixed or so small that mapping them separately is impractical.

Typically, the Downs soil has a surface layer of very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown and dark brown, friable silt loam about 8 inches thick. The subsoil is about 44 inches thick. It is friable. The upper part is brown and dark yellowish brown silt loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has strong brown and grayish brown mottles. In places sandy material is at a depth of 4 to 8 feet.

The Urban land is covered by homes, streets, buildings, parking lots, and other structures that obscure or alter the soils so that identification of the soil series is not feasible. It also includes exposed land that has been graded, filled, and reworked with earthmoving equipment so that the original soils no longer exist in the unit.

Permeability of the Downs soil is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is about 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a very low supply of available potassium.

Properties of the Urban land vary. Most areas of this unit are drained by sewer systems, gutters, and drainage tile. In most areas of the unit, 2 to more than 6 feet of fill material has been added to the original soil or 2 to more than 6 feet of the original soil has been removed.

This map unit is suited to urban development. Onsite investigation is necessary to ensure that proper design and installation procedures have been followed.

No land capability classification is assigned.

4162D—Downs-Urban land complex, 9 to 14 percent slopes. This map unit consists of intermingled areas of a strongly sloping, well drained Downs soil and areas of Urban land on convex upland ridgetops and side slopes in and around the city of Davenport. Areas range from 5 to 100 acres in size and are irregularly shaped. They are about 50 percent Downs soil, 40 percent Urban land, and 10 percent other soils. This soil and the Urban land occur as areas so intricately mixed or so small that mapping them separately is impractical.

Typically, the surface layer of the Downs soil is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 36 inches thick. It is friable. The upper part is brown silt loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has strong brown and grayish brown mottles. In places sandy material is at a depth of 4 to 8 feet.

The Urban land is covered by homes, streets, buildings, parking lots, and other structures that obscure or alter the soils so that identification of the soil series is not feasible. It also includes exposed land that has been graded, filled, and reworked with earthmoving equipment so that the original soils no longer exist in the unit.

Permeability of the Downs soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a very low supply of available potassium.

Properties of the Urban land vary. Most areas of this map unit are drained by sewer systems, gutters, and drainage tile. In most areas of the unit, 2 to more than 6 feet of fill material has been added to the original soil or 2 to more than 6 feet of the original soil has been removed.

This map unit is suited to urban development. Onsite investigation is necessary to ensure that proper design and installation procedures have been followed.

No land capability classification is assigned.

4163E—Fayette-Urban land complex, 14 to 25 percent slopes. This map unit consists of intermingled areas of a moderately steep and steep, well drained Fayette soil and areas of Urban land on convex upland ridgetops and side slopes in and around the cities of Davenport and Bettendorf. Areas range from 5 to 50 acres in size and are irregularly shaped. They are about 50 percent Fayette soil and 40 percent Urban land. This soil and the Urban land occur as areas so intricately mixed or so small that mapping them separately is impractical.

Typically, the surface layer of the Fayette soil is very dark gray, friable silt loam about 3 inches thick. The subsurface layer is dark gray and grayish brown, friable silt loam about 8 inches thick. The subsoil is about 36 inches thick. It is friable. The upper part is brown silty clay loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silt loam. The substratum to a depth of about 60 inches is yellowish brown silt loam that has strong brown and grayish brown mottles. In places the surface layer is dark grayish brown silt loam about 7 inches thick.

The Urban land is covered by homes, streets, buildings, parking lots, and other structures that obscure or alter the soils so that identification of the soil series

is not feasible. It also includes exposed land that has been graded, filled, and reworked with earthmoving equipment so that the original soils no longer exist in the unit.

Included in mapping are areas of soils that have slopes of more than 25 percent. These soils make up about 10 percent of the unit.

Permeability of the Fayette soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 2 to 3 percent. The subsoil has a high supply of available phosphorus and a low supply of available potassium.

Properties of the Urban land vary. Most of this unit is drained by sewer systems, gutters, and drainage tile. In most areas of the unit, 2 to more than 6 feet of fill material has been added to the original soil or 2 to more than 6 feet of the original soil has been removed.

This map unit is suited to urban development. Onsite investigation is necessary to ensure that proper design and installation procedures have been followed.

No land capability classification is assigned.

4220—Nodaway-Urban land complex, 0 to 3 percent slopes. This map unit consists of intermingled areas of a nearly level, moderately well drained Nodaway soil and areas of Urban land on flood plains in and around the cities of Davenport and Bettendorf. The flood plains are in areas of recently deposited sediment. The map unit is subject to flooding. Areas range from 10 to more than 100 acres in size and are irregularly shaped. They are about 50 percent Nodaway soil, 40 percent Urban land, and 10 percent other soils. This soil and the Urban land occur as areas so intricately mixed or so small that mapping them separately is impractical.

Typically, the surface layer of the Nodaway soil is very dark grayish brown, friable silt loam about 8 inches thick. The substratum to a depth of about 60 inches is stratified dark grayish brown, brown, dark brown, and very dark grayish brown, friable silt loam.

The Urban land is covered by streets, parking lots, buildings, shopping centers, and other structures that obscure or alter the soils so that identification of the soil series is not feasible. It also includes exposed land that has been graded, filled, and reworked with earthmoving equipment so that the original soils no longer exist in the unit.

Permeability is moderate in the Nodaway soil, and runoff is slow. Available water capacity is high. The content of organic matter in the surface layer is about 2.5 to 3.5 percent. The seasonal high water table is at a depth of 3 to 5 feet. The substratum generally has a medium supply of available phosphorus and a very low supply of available potassium.

The Urban land has a seasonal high water table. The other properties of the Urban land vary. Most areas of this unit are drained by sewer systems, gutters, and drainage tile. Much of the unit has 2 to more than 4 feet of fill material over the original soils.

This map unit is suited to urban development. Onsite investigation is necessary to ensure that proper design and installation procedures have been followed.

No land capability classification is assigned.

4291—Atterberry-Urban land complex, 0 to 2 percent slopes. This map unit consists of intermingled areas of a nearly level, poorly drained Atterberry soil and areas of Urban land on broad upland divides and in the upper part of concave drainageways in and around the cities of Davenport and Bettendorf. Areas range from 10 to 50 acres in size and are irregularly shaped. They are about 50 percent Atterberry soil, 40 percent Urban land, and 10 percent other soils. This soil and the Urban land occur as areas so intricately mixed or so small that mapping them separately is impractical.

Typically, the surface layer of the Atterberry soil is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is mottled, friable silty clay loam about 40 inches thick. The upper part is brown, and the lower part is grayish brown. The substratum to a depth of about 60 inches is grayish brown, mottled silty clay loam.

The Urban land is covered by streets, parking lots, buildings, shopping centers, and other structures that obscure or alter the soil so that identification of the soil series is not feasible. It also includes exposed land that has been graded, filled, and reworked with earthmoving equipment so that the original soils no longer exist in the unit.

Permeability is moderate in the Atterberry soil, and runoff is slow. The seasonal high water table is at a depth of 1 to 3 feet. Available water capacity is high. The content of organic matter in the surface layer is about 3 to 4 percent. The subsoil has a medium supply of available phosphorus and a very low supply of available potassium.

Properties of the Urban land vary. Most areas of this unit are drained by sewer systems, gutters, and drainage tile. In most areas of the unit, 2 to more than 4 feet of fill material has been added to the original soil or 2 to more than 6 feet of the original soil has been removed.

This map unit is suited to urban development. Onsite investigation is necessary to ensure that proper design and installation procedures have been followed.

No land capability classification is assigned.

4977B—Richwood-Urban land complex, 1 to 5 percent slopes. This map unit consists of intermingled areas of a gently sloping, well drained Richwood soil and areas of Urban land on the convex slopes of stream terraces in and around the city of Davenport. Areas range from 10 to 50 acres in size and are irregularly shaped. They are about 50 percent Richwood soil, 40 percent Urban land, and 10 percent other soils. This soil and the Urban land occur as areas so intricately mixed or so small that mapping them separately is impractical.

Typically, the surface layer of the Richwood soil is very dark brown, friable silt loam about 9 inches thick. The subsurface layer is very dark grayish brown and dark brown, friable silt loam about 14 inches thick. The subsoil to a depth of about 60 inches is yellowish brown, friable silt loam. In places loam or silty clay loam is within a depth of 40 inches.

The Urban land is covered by streets, parking lots, buildings, shopping centers, and other structures that obscure or alter the soil so that identification of the soil series is not feasible. It also includes exposed land that has been graded, filled, and reworked with earthmoving equipment so that the original soils no longer exist in the unit.

Permeability is moderate in the Richwood soil, and runoff is slow. Available water capacity is high. The content of organic matter in the surface layer is about 3.5 to 4.5 percent. The subsoil has a low supply of available phosphorus and a very low supply of available potassium.

Properties of the Urban land vary. Most areas of this unit are drained by sewer systems, gutters, and drainage tile. In most areas of the unit, 2 to more than 6 feet of fill material has been added to the original soil or 2 to more than 6 feet of the original soil has been removed.

This map unit is suited to urban development. Onsite investigation is necessary to ensure that proper design and installation procedures have been followed.

No land capability classification is assigned.

5010—Pits, sand and gravel. This map unit dominantly is on stream terraces. The pits generally are actively mined each year. Areas range from a few acres to more than 40 acres in size. They generally are square or rectangular.

Typically, available water capacity is low or very low in the soil material. Almost no vegetation is in the unit because the available water capacity is limited and because most areas of the unit are mined each year. Areas of this unit have little or no value as farmland. Some areas could be reclaimed as farmland if the landscape is leveled and the overburden is returned to the site after the sand and gravel have been mined. Most areas need to be reclaimed if they are used for wildlife habitat. Some areas have water in the lowest part of the pit, but they generally are pumped dry when the mining is in operation.

No land capability classification is assigned.

5030—Pits, limestone quarries. This map unit consists of pits from which limestone has been quarried, primarily for use in road construction and as agricultural lime. The pits are 40 or more feet deep and are surrounded by piles of spoil 15 or more feet high. They range from a few acres to 100 acres in size. They are irregularly shaped. Some of the pits have steep sides and contain water, which is a few to many feet deep.

The spoil surrounding the pits varies in texture but generally is loamy and contains varying amounts of limestone fragments. It is derived from glacial till, eolian material, or a mixture of the glacial till and eolian material. In some areas it is very uneven. In other areas, it has been leveled and smoothed and grasses or trees grow reasonably well.

The quarries are well suited to wildlife habitat. Those containing water can provide habitat for fish. Because of the steepness of the sides of the pits and the variable depth of the water, the pits could be dangerous as sites for recreation and wildlife habitat. Onsite investigation is needed to determine if a hazard exists.

No land capability classification is assigned.

5040—Orthents, loamy. These nearly level to strongly sloping soils are used as borrow areas for construction. In some areas the original soil has been removed to a depth of 5 to 20 feet or more. In other areas 4 to 10 inches of topsoil has been redistributed on the surface, commonly in an uneven pattern. The soils range from excessively drained to somewhat poorly drained, depending on the kind of material from which the soils were derived and the extent to which the borrow area is restored. Areas typically range from about 6 to 50 acres in size.

Typically, the upper 60 inches of these soils is yellowish brown, friable silty clay loam and firm clay loam. In many places pebbles are common on the surface. In some places the soil material is sandy loam. In other places the soil material at the surface is very dark gray or dark brown.

Included with these soils in mapping are small areas of sand. Also included are a few areas formerly used as dumps or landfills that have now been covered with soil material.

Permeability varies in the Orthents, depending on the texture and density of the soil material. Runoff is slow to rapid. Available water capacity is moderate or low. The soil material that was once buried 5 to 20 feet or more beneath the surface has less pore space and a higher density than the original surface layer. It has not been appreciably affected by the processes of soil formation, such as freezing and thawing. Preparing a good seedbed is difficult. Drought is a hazard. In most areas these soils have a very low supply of available phosphorus and potassium.

These soils are better suited to small grain and to grasses and legumes for hay and pasture than to row crops. They are suited to row crops only in areas where the topsoil has been redistributed. Corn and soybeans are grown in these areas. If cultivated crops are grown, erosion is a moderate or severe hazard in the more sloping areas. A system of conservation tillage that disturbs the soil as little as possible and leaves crop residue on the surface helps to control erosion and stabilize the soils.

No land capability classification is assigned.

5080—Orthents, nearly level. These soils are in areas that have been or are being used as sanitary landfills or dumps and in areas that have been filled with soil material, pieces of concrete, and material from asphalt roads. They range from excessively drained to somewhat poorly drained, depending on the kind of material at and under the surface. Areas range from 5 to 20 acres in size.

Typically, the upper 5 feet of these soils is mixed dark brown and dark yellowish brown, friable silt loam and silty clay loam. In places it contains iron, steel, or wood.

Permeability is moderate to very slow. Runoff is slow or very slow. Available water capacity is moderate or high. The supply of phosphorus and potassium is very low.

Nearly all areas of these soils support a permanent cover of grass, but some are used for industrial purposes. Some are suited to permanent pasture, hay, and recreational uses, depending on the underlying material and the amount of topsoil that has been redistributed on the surface.

No land capability classification is assigned.

Prime Farmland

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

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. 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 5 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 150,000 acres in the survey area, or nearly 50 percent of the total acreage, meets the soil requirements for prime farmland. Scattered areas of this land are throughout the county, but most are in the central part, mainly in associations 1, 2, and 6, which are described under the heading "General Soil Map Units." Nearly all of this prime farmland is used for crops. The crops grown on this land, mainly corn and soybeans, account for an estimated two-thirds of the county's total agricultural income each year.

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

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table qualify as prime farmland only in areas where this limitation has been overcome by drainage measures. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not this limitation has been overcome by corrective measures.

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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

Lonnie Miller, 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.

Good land use should be based on the properties and potential of the soils. This soil survey can greatly facilitate the application of the latest technology to increase food production from existing cropland areas.

In 1980, about 202,560 acres in Scott County was used as cropland. Of this total, about 139,000 acres was planted to corn and about 42,800 acres was planted to soybeans. The remaining acreage of cropland was mainly used for hay, oats, or wheat or was diverted land.

Soil erosion is the major management concern on cropland in the county. It is a hazard on soils that have slopes of more than 2 percent. Loss of the surface layer through erosion is damaging for many reasons. Productivity can be affected by the loss of fertilizer and other chemicals. Also, as the surface layer becomes thinner, the subsoil is incorporated into the plow layer. In areas where erosion is severe, crops can be physically damaged when the plants are uprooted or when they are covered with sediment.

Erosion of the surface layer can cause pollution of streams and lakes by sediments and chemicals. By controlling erosion, the quality of water in streams and lakes can be improved for municipal and recreational uses and for fish and wildlife.

Measures that are effective in controlling erosion generally are those that provide a protective surface cover, help to control runoff, and increase the rate of water infiltration. A cropping system that keeps vegetative cover on the soils for extended periods holds soil losses to an amount that will not reduce the

productive capacity of the soils. Including grasses and legumes in the crop rotation helps to control erosion, provides nitrogen for the following crop, and improves tilth.

Some soils in the county have slopes that are so short, steep, and irregular that contour farming and terracing are not practical. Applying a cropping system that includes a substantial amount of vegetative cover helps to control erosion in these areas.

Minimizing tillage and leaving crop residue on the surface increase the rate of water infiltration and help to control runoff and erosion. These practices can be adapted to all tillable soils in the survey area. No-till farming of corn and soybeans helps to control erosion in areas that are cropped year after year.

Terraces reduce the length of slopes and help to control runoff and erosion. They are best suited to well drained and moderately well drained, gently sloping and moderately sloping soils that have long, smooth slopes. The gently sloping Downs, Fayette, and Tama soils are well suited to terracing.

Contour farming and contour stripcropping also help to control erosion. They are best suited to soils that have smooth, uniform slopes. They are very effective in some parts of the county, but in other parts they are impractical.

Soil blowing is a hazard in the county. It is not a major problem, except in areas of sandy or loamy soils, such as the Dickinson, Perks, and Sparta soils. It can damage crops on these soils if the wind is strong and the soils are dry. Maintaining a vegetative cover or surface mulch is the best management practice on these soils.

Information about the design of erosion-control measures for each kind of soil is contained in the "Technical Guide," which is available at the local office of the Natural Resources Conservation Service.

Wetness is a management concern in some areas of the county. Some soils in the uplands are naturally wet and poorly drained. Examples are the Garwin and Walford soils. Other soils on low benches and bottom land are naturally wet. Examples are the Colo, Marshan, and Zook soils. Most of the poorly drained soils are more productive if a tile drainage system is installed. Somewhat poorly drained soils, such as Atterberry, Klinger, and Muscatine, also benefit from a tile drainage system. If the soils are drained, fieldwork is less likely to be delayed by the wetness, a better air-to-water ratio is maintained, and the growth of roots is improved.

Many waterways and drainageways are naturally wet because of seepy areas on slopes. A tile drainage system makes the soils in these areas easier to farm and enhances other conservation practices. If a tile drainage system is installed, the areas can be crossed with farm equipment and grassed waterways can be maintained.

Soils in the county generally are naturally acid. Applications of ground limestone are needed to raise the pH level to that required for the optimum growth of crops. Because ground limestone was heavily applied in the past, soil tests are needed to determine whether additional applications of limestone are necessary. Overapplication of ground limestone can affect the uptake of some nutrients. Some agricultural chemicals may be affected by the pH level of the soils as well.

The subsoil of most of the soils in the county generally has a low supply of available potash. The subsoil of most of the soils in the uplands generally has a medium supply of available phosphorus.

Soil tests of the tilled layer are used to determine the most profitable rates of fertilizers for various crops. Nutrient levels in the subsurface layer influence crop yields, particularly in drier periods when the nutrients in the dry tilled layer become temporarily unavailable to plants. The availability of nutrients in the tilled layer and the subsoil influence the relative uptake from the two zones in the soil profile.

Applications of lime and fertilizer should be based on the results of soil tests, the needs of the crop, and the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime that should be applied.

Tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils that have good tilth generally have a high content of organic matter.

Most of the soils used as cropland in the county have a surface layer of silt loam or silty clay loam. The content of organic matter in the surface layer ranges from less than 1 to more than 4 percent in some of the nearly level prairie soils.

The soils in the county should not be plowed in the fall. Moldboard plowing leaves very little crop residue on the surface. As a result, the susceptibility of the soils to water erosion during periods of snowmelt and spring runoff is increased.

Soil compaction has been an increasing problem. With the increase in the size of farm equipment, soil compaction has become a major factor in crop production. Tilling soils when they are wet and operating heavy equipment at the wrong time of the year have resulted in a decrease in yields on most of the soils in the county.

Corn and soybeans are the most commonly grown crops. The soils and climate of the survey area are suited to many field crops that are not commonly grown. Grain sorghum, sunflowers, potatoes, sugar beets,

sweet corn, popcorn, pumpkins, sugar cane, canning peas, canning beans, and navy beans can be grown. Alfalfa and smooth brome grow very well as forage crops along with red clover and orchardgrass. The most common close-growing crop is oats. Rye, barley, buckwheat, wheat, and flax also can be grown.

The management of hay as a viable alternative to growing corn and soybeans has increased the importance of forage production. A cropping sequence that includes grasses and legumes helps to control erosion. Alfalfa is the most commonly grown legume because of its value as a cash crop. Other legumes grown are red clover, alsike clover, and crownvetch. The grasses commonly grown in the county are smooth brome, bluegrass, orchardgrass, and timothy.

If cultivated crops are grown prior to seeding grasses or legumes, soil losses can be minimized by conservation tillage and contour farming. Interseeding grasses or legumes into the existing plant cover also is an option. The existing sod does not need to be destroyed in order to prepare the seedbed for planting.

Specialty crops presently grown in the county for commercial purposes include sweet corn, canning beans, onions, tomatoes, strawberries, and asparagus. The well drained soils in the county are well suited to orchard, berry, sod, and nursery crops. Generally, the soils in the lower, wetter areas are not suited to specialty crops. More specific information on commercially grown specialty crops can be obtained at the local office of the Cooperative Extension Service.

Yields per Acre

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

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

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the 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. 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.

Corn Suitability Ratings

Corn suitability ratings provide a relative ranking of all of the soils mapped in the State of Iowa based on the potential of the soils to be used for intensive production of row crops. The corn suitability rating is an index that can be used to rate the potential production of one soil against another soil over a period of time. The average weather conditions and the frequency of use of the soil for row crop production are considered in the corn suitability rating. Ratings range from 100 for soils that have no physical limitations, occur on minimal slopes, and can be continuously row cropped to as low as 5 for soils that have severe limitations when used for row crops. The criteria used to determine the ratings listed in table 6 are that the soil is properly managed, is not irrigated, has been drained where needed, is not affected by frequent flooding, and has not been leveled or terraced. The reasons why the weighted corn suitability rating for a given field can be modified include if the field includes sandy spots, local deposits, outcrops of rock or gravel, and drainageways that cannot be crossed with machinery and the boundary of the field. Even though predicted average yields change with time, the corn suitability ratings are expected to remain relatively constant in relation to one another over time.

The corn suitability ratings in Scott County range from 5 for map unit 65G, Lindley loam, 25 to 40 percent slopes, to 100 for map unit 119, Muscatine silty clay loam, 0 to 2 percent slopes. Ratings are not assigned to miscellaneous areas or urban land in the county because the properties and use of these units vary. The corn suitability ratings are listed in the yields table.

Woodland Management and Productivity

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.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *productivity class*. 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 *productivity class*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic meters per hectare per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

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

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

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

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

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

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

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils are gently sloping 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

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

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

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be

established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

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

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

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, orchardgrass, 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 elderberry. 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, 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 landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

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

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

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

Table 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 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

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

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

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

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil

texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

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

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

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal 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; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, 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.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and 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.

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 soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed

channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help 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.

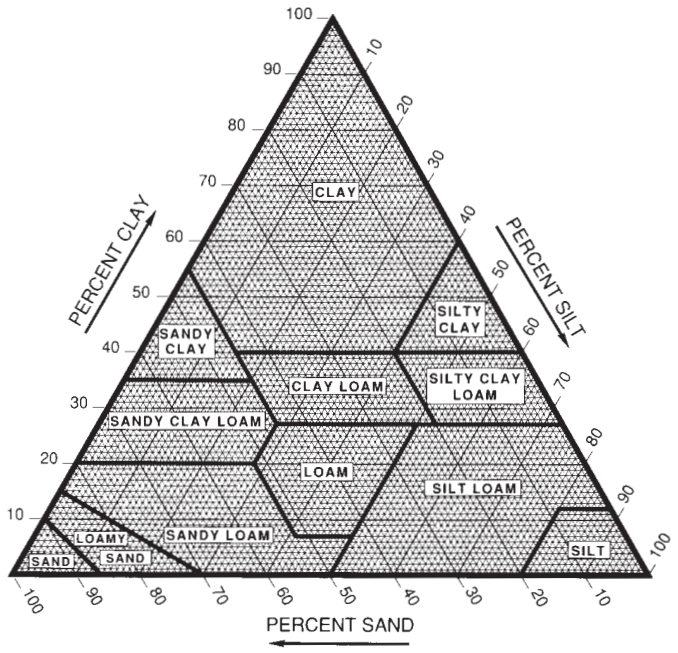

Figure 13.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

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 *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering

properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments 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 1/3-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems 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 rock fragments on the surface or because of surface wetness.

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 and 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.

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Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(10)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. 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 udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic 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-loamy, mixed, mesic Typic 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" *(11)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(10)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Ackmore Series

The Ackmore series consists of somewhat poorly drained, moderately permeable soils on flood plains, on alluvial fans, and in drainageways in the uplands. These soils formed in recently deposited, silty alluvium. The

native vegetation is tall prairie grasses. Slopes range from 0 to 5 percent.

Typical pedon of Ackmore silt loam, 0 to 2 percent slopes, in a pastured area; 2,100 feet west and 240 feet north of the center of sec. 23, T. 80 N., R. 4 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam (about 26 percent clay), brown (10YR 5/3) dry; weak fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

C1—7 to 16 inches; very dark grayish brown (10YR 3/2) silt loam (about 26 percent clay); some dark grayish brown (10YR 4/2) strata; massive with horizontal cleavage planes; friable; common very fine roots; neutral; gradual wavy boundary.

C2—16 to 27 inches; stratified very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) silt loam; some strata having a high content of sand (about 26 percent clay); massive with horizontal cleavage planes; friable; common fine roots; neutral; clear wavy boundary.

2Ab1—27 to 46 inches; black (N 2/0) silty clay loam (about 30 percent clay); weak fine granular structure; friable; neutral; gradual wavy boundary.

2Ab2—46 to 60 inches; black (N 2/0) silty clay loam (about 32 percent clay); weak fine granular structure; friable; neutral.

The thickness of the A horizon ranges from 5 to 10 inches. The combined thickness of the A and C horizons ranges from 20 to 36 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It contains 20 to 30 percent clay. The C horizon has value of 3 to 5 and chroma of 1 or 2. It is silt loam or silty clay loam. The 2Ab horizon has value of 2 or 3 and chroma of 0 or 1. It contains 26 to 35 percent clay.

Ambraw Series

The Ambraw series consists of poorly drained, moderately slowly permeable soils on flood plains. These soils formed in loamy alluvium. The native vegetation is tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Ambraw clay loam, 0 to 2 percent slopes, in an area of cropland; 880 feet west and 1,540 feet north of the southeast corner of sec. 5, T. 77 N., R. 3 E.

Ap—0 to 9 inches; black (10YR 2/1) clay loam (about 28 percent clay), dark gray (10YR 4/1) dry; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A1—9 to 14 inches; black (10YR 2/1) clay loam (about 28 percent clay), dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; firm; many fine roots; neutral; clear wavy boundary.

A2—14 to 21 inches; very dark gray (10YR 3/1) clay loam (about 30 percent clay), gray (10YR 5/1) dry; few fine faint dark gray (10YR 4/1) and dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky structure; firm; common fine roots; few fine dark concretions of iron and manganese oxide; neutral; clear wavy boundary.

Bg1—21 to 27 inches; mottled dark gray (10YR 4/1), dark grayish brown (10YR 4/2), and brown (10YR 5/3) clay loam (about 30 percent clay); few fine faint very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine prominent yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; common fine roots; few fine dark concretions of iron and manganese oxide; neutral; gradual wavy boundary.

Bg2—27 to 38 inches; mottled dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4) sandy clay loam (about 26 percent clay); few fine distinct very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine distinct dark gray (10YR 4/1) and common fine prominent strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; friable; few fine roots; few fine dark concretions of iron and manganese oxide; neutral; gradual wavy boundary.

Bg3—38 to 43 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) sandy clay loam (about 27 percent clay); few fine prominent strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; few fine dark concretions of iron and manganese oxide; few very dark grayish brown (10YR 3/2) streaks on vertical faces of peds; neutral; clear wavy boundary.

Bg4—43 to 48 inches; mottled gray (10YR 5/1) and yellowish brown (10YR 5/4) clay loam (about 32 percent clay); few fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak medium subangular blocky structure; friable; common fine dark concretions of iron and manganese oxide; neutral; clear wavy boundary.

Cg1—48 to 52 inches; mottled dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4) sandy loam (about 19 percent clay); few fine faint dark gray (10YR 4/1) mottles; massive; friable; few fine dark concretions of iron and manganese oxide; neutral; clear wavy boundary.

Cg2—52 to 60 inches; mottled strong brown (7.5YR 5/6) and dark gray (10YR 4/1) clay loam (about 29 percent clay); massive; friable; few fine dark concretions of iron and manganese oxide; neutral.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the mollic epipedon ranges from 12 to 24 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The B horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 to 4. It is loam, sandy clay loam, clay loam, or sandy loam. The C horizon is stratified. It ranges from clay loam to sand.

Aredale Series

The Aredale series consists of well drained, moderately permeable soils on upland side slopes and ridgetops. These soils formed in loamy surficial sediments underlain by glacial till. The native vegetation is tall prairie grasses. Slopes range from 2 to 14 percent.

Typical pedon of Aredale silt loam, 2 to 5 percent slopes, in an area of cropland; 1,780 feet west and 2,440 feet north of the southeast corner of sec. 23, T. 80 N., R. 3 E.

Ap—0 to 8 inches; very dark brown (10YR 2/2) silt loam (about 24 percent clay), grayish brown (10YR 4/2) dry; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A—8 to 14 inches; very dark grayish brown (10YR 3/2) silt loam (about 24 percent clay), grayish brown (10YR 5/2) dry; many faint very dark brown (10YR 2/2) coatings on faces of peds; weak very fine subangular blocky structure; friable; common fine roots; neutral; clear smooth boundary.

Bw1—14 to 20 inches; dark yellowish brown (10YR 4/4) loam (about 25 percent clay); few distinct dark brown (10YR 3/2) coatings on faces of peds; weak fine subangular blocky structure; friable; common fine roots; few fine dark concretions of oxide; moderately acid; gradual smooth boundary.

Bw2—20 to 28 inches; yellowish brown (10YR 5/4) loam (about 23 percent clay); moderate fine subangular blocky structure; friable; common fine roots; moderately acid; clear smooth boundary.

Bw3—28 to 36 inches; yellowish brown (10YR 5/4) loam (about 20 percent clay); moderate medium subangular blocky structure; friable; few fine roots; common fine dark concretions of oxide; moderately acid; abrupt smooth boundary.

2Bw4—36 to 48 inches; yellowish brown (10YR 5/4) sandy loam (about 12 percent clay); common fine distinct yellowish brown (10YR 5/8) and common fine distinct pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; very friable; few fine roots; few dark concretions of oxide; few pebbles; moderately acid; abrupt smooth boundary.

3BC—48 to 56 inches; yellowish brown (10YR 5/4) loam (about 26 percent clay); few fine distinct light brownish gray (2.5Y 6/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure; firm; common dark concretions of oxide; few pebbles; moderately acid; clear smooth boundary.

3C—56 to 60 inches; yellowish brown (10YR 5/6) and dark grayish brown (10YR 4/2) loam (about 26 percent clay); massive; firm; few pebbles; neutral.

The solum typically is 4 or more feet thick. Loamy glacial till typically is at a depth of 3.5 to 6.0 feet. In some pedons a layer of sandy loam that is as much as 24 inches thick is directly above the glacial till.

The A horizon is loam or silt loam that has a high content of sand. The upper part of the Bw horizon typically is loam or silt loam, but the range includes clay loam and sandy clay loam. The lower part of the Bw horizon typically is loam, silt loam, or sandy loam that has thin lenses of loamy sand.

The Aredale soils in detailed soil map units 426C2 and 426D2 are taxadjuncts to the Aredale series because their dark surface layer is not thick enough to qualify as a mollic epipedon.

Atterberry Series

The Atterberry series consists of somewhat poorly drained, moderately permeable soils on ridgetops in the uplands. These soils formed in loess. The native vegetation is mixed prairie grasses and deciduous trees. Slopes range from 0 to 2 percent.

Typical pedon of Atterberry silt loam, 0 to 2 percent slopes, in an area of cropland; 1,300 feet south and 2,000 feet east of the northwest corner of sec. 12, T. 77 N., R. 2 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam (about 22 percent clay), brown (10YR 5/3) dry; weak fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Bt1—8 to 12 inches; brown (10YR 5/3) silty clay loam (about 30 percent clay); few fine faint grayish brown (10YR 5/2) mottles; moderate very fine granular structure; friable; common fine roots; many faint brown (10YR 4/3) clay films on faces of peds; neutral; clear wavy boundary.

Bt2—12 to 18 inches; brown (10YR 5/3) silty clay loam (about 33 percent clay); common fine distinct yellowish brown (10YR 5/6), few fine prominent strong brown (7.5YR 5/6), and common fine faint grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; friable; common fine roots; many faint brown (10YR 4/3) clay films on faces of peds; few fine dark concretions of iron and

manganese oxide; neutral; clear wavy boundary.
Bt3—18 to 27 inches; grayish brown (10YR 5/2) silty clay loam (about 32 percent clay); many fine faint brown (10YR 5/3), common fine distinct yellowish brown (10YR 5/6), and few fine prominent strong brown (7.5YR 5/6) mottles; moderate fine subangular and angular blocky structure; friable; few fine roots; many faint brown (10YR 5/3) clay films on faces of peds; light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; slightly acid; clear wavy boundary.
Bt4—27 to 37 inches; grayish brown (10YR 5/2) silty clay loam (about 30 percent clay); many fine faint brown (10YR 5/3), common fine distinct yellowish brown (10YR 5/6), and few fine prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine roots; few faint clay films on faces of peds; light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; moderately acid; gradual wavy boundary.
BC—37 to 48 inches; grayish brown (10YR 5/2) silty clay loam (about 28 percent clay); many fine faint brown (10YR 5/3), common fine distinct yellowish brown (10YR 5/6), and few fine prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure; friable; few fine roots; few fine dark concretions of iron and manganese oxide; few prominent very dark brown (7.5YR 2/2) stains on faces of some peds; moderately acid; gradual wavy boundary.
C—48 to 60 inches; grayish brown (10YR 5/2) silty clay loam (about 28 percent clay); many fine faint brown (10YR 5/3), common fine distinct yellowish brown (10YR 5/6), and few fine prominent strong brown (7.5YR 5/6) mottles; massive; friable; common fine dark concretions of iron and manganese oxide; few prominent very dark brown (7.5YR 2/2) stains on faces of some peds; slightly acid.

The thickness of the solum ranges from 45 to more than 60 inches. The thickness of the Ap or A horizon ranges from 6 to 9 inches.

The Ap or A horizon has value of 2 or 3 and chroma of 1 or 2. It contains 20 to 26 percent clay. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It contains 27 to 35 percent clay.

Bolan Series

The Bolan series consists of well drained soils on stream terraces. These soils formed in loamy windblown material and sandy alluvium. The native vegetation is tall prairie grasses. Permeability is moderate in the upper part of the solum and rapid in the lower part. Slopes range from 0 to 2 percent.

Typical pedon of Bolan loam, 0 to 2 percent slopes, in an area of cropland; 1,300 feet north and 1,650 feet west of the southeast corner of sec. 21, T. 80 N., R. 5 E.

Ap—0 to 10 inches; black (10YR 2/1) loam (16 percent clay), dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.
A1—10 to 16 inches; black (10YR 2/1) loam (17 percent clay), dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; slightly acid; gradual wavy boundary.
A2—16 to 23 inches; very dark brown (10YR 2/2) loam (18 percent clay); weak fine granular structure; friable; slightly acid; gradual wavy boundary.
AB—23 to 32 inches; very dark grayish brown (10YR 3/2) loam (16 percent clay); very dark brown (10YR 2/2) coatings on faces of peds; weak fine subangular blocky structure; friable; moderately acid; gradual wavy boundary.
Bw—32 to 39 inches; dark brown (10YR 3/3) fine sandy loam (12 percent clay); very dark grayish brown (10YR 3/2) coatings on faces of peds; weak fine subangular blocky structure; friable; moderately acid; gradual wavy boundary.
BC—39 to 48 inches; brown (10YR 4/3) loamy fine sand (7 percent sand); single grain; loose; moderately acid; gradual wavy boundary.
2C1—48 to 56 inches; dark yellowish brown (10YR 4/4) loamy sand (7 percent sand) that has a 2-inch-thick layer of loam; single grain; loose; moderately acid; clear wavy boundary.
2C2—56 to 60 inches; yellowish brown (10YR 5/4) fine sand (2 percent clay); single grain; loose; moderately acid.

The thickness of the solum ranges from 45 to 60 inches. The thickness of the mollic epipedon ranges from 24 to 36 inches.

The A horizon has value of 2 or 3 and chroma of 1 to 3. It dominantly is loam, but the range includes silt loam that has a high content of very fine sand or fine sand. The Bw horizon has value of 3 to 5 and chroma of 3 to 6. The C horizon has value of 4 or 5 and chroma of 4 to 6. It ranges from sandy loam to coarse sand.

Canoe Series

The Canoe series consists of somewhat poorly drained, moderately permeable soils on stream terraces. These soils formed in silty sediments. The

native vegetation is mixed trees and prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Canoe silt loam, 0 to 2 percent slopes, in an area of cropland; 1,825 feet north and 140 feet west of the southeast corner of sec. 8, T. 79 N., R. 2 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam (about 20 percent clay), grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

E—8 to 17 inches; dark grayish brown (10YR 4/2) silt loam (about 19 percent clay); few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium platy structure; friable; common fine dark concretions of oxide; neutral; gradual wavy boundary.

EB—17 to 23 inches; brown (10YR 5/3) silt loam (about 20 percent clay); common fine faint dark grayish brown (10YR 4/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium platy structure parting to moderate fine subangular blocky; friable; common fine dark concretions of oxide; neutral; gradual wavy boundary.

Bt1—23 to 29 inches; grayish brown (10YR 5/2) silty clay loam (about 28 percent clay); common faint dark grayish brown (10YR 4/2) coatings on faces of peds; many fine distinct yellowish brown (10YR 5/6) and few fine distinct brown (10YR 5/4) mottles; moderate fine subangular blocky structure; friable; many faint pale brown (10YR 6/3 dry) silt coatings; few fine dark concretions of oxide; slightly acid; gradual wavy boundary.

Bt2—29 to 36 inches; grayish brown (10YR 5/2) silty clay loam (about 30 percent clay); common faint dark grayish brown (10YR 4/2) coatings on faces of peds; common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine angular blocky structure; friable; many faint clay films on faces of peds; many faint pale brown (10YR 6/3 dry) silt coatings; few fine dark concretions of oxide; moderately acid; gradual wavy boundary.

Bt3—36 to 54 inches; grayish brown (10YR 5/2) silty clay loam (about 30 percent clay); few fine faint yellowish brown (10YR 5/6) and few fine faint dark grayish brown (10YR 4/2) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; friable; many faint clay films on faces of peds; many faint pale brown (10YR 6/3 dry) silt coatings on faces of peds; few fine dark concretions of oxide; moderately acid; gradual wavy boundary.

C—54 to 60 inches; yellowish brown (10YR 5/4) silt loam (about 23 percent clay); few fine faint yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; massive; friable; few fine dark concretions of oxide; slightly acid.

The Ap horizon has value of 2 or 3 and chroma of 1 to 3. It ranges from 6 to 10 inches in thickness. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is silt loam or silty clay loam that contains 20 to 30 percent clay. The C horizon is silt loam or silty clay loam.

Chelsea Series

The Chelsea series consists of excessively drained, rapidly permeable soils on stream terraces and upland side slopes. These soils formed in sandy eolian material and sandy alluvium that has been reworked by wind. The native vegetation is deciduous trees. Slopes range from 5 to 25 percent.

Typical pedon of Chelsea loamy fine sand, 9 to 18 percent slopes, in a pastured area; 2,225 feet south and 140 feet west of the northeast corner of sec. 25, T. 80 N., R. 4 E.

Ap—0 to 8 inches; brown (10YR 4/3) loamy fine sand (about 11 percent clay); weak medium granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.

E1—8 to 17 inches; dark yellowish brown (10YR 4/4) loamy sand (about 10 percent clay); single grain; loose; few fine roots; slightly acid; clear wavy boundary.

E2—17 to 48 inches; yellowish brown (10YR 5/4) fine sand (about 8 percent clay); single grain; loose; moderately acid; gradual smooth boundary.

E/Bt—48 to 60 inches; yellowish brown (10YR 5/4) fine sand (about 6 percent clay); 1.0- to 1.25-inch-thick bands of brown (7.5YR 5/4) loamy fine sand; single grain; loose; moderately acid.

The solum is 4 or more feet thick. The thickness of the surface layer varies considerably.

The A horizon has value of 3 or 4 and chroma of 2 or 3. It typically is loamy fine sand. The E horizon has value of 4 to 6 and chroma of 3 to 6. The B part of the E/Bt horizon contains 0.25- to 2-inch-thick lamellae. The lamellae have hue of 7.5YR or 10YR and value and chroma of 3 to 5. They are loamy fine sand or fine sandy loam.

Clyde Series

The Clyde series consists of poorly drained, moderately permeable soils in drainageways and the

lower concave areas on uplands. These soils formed in loamy material and in the underlying glacial till. The native vegetation is prairie grasses. Slopes range from 0 to 3 percent.

Typical pedon of Clyde clay loam, 0 to 3 percent slopes, in a cultivated field; 1,100 feet west and 85 feet north of the southeast corner of sec. 17, T. 80 N., R. 3 E.

Ap—0 to 8 inches; black (10YR 2/1) clay loam (about 28 percent clay), dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.
A—8 to 18 inches; black (N 2/0) clay loam (about 28 percent clay), dark gray (10YR 4/1) dry; moderate very fine subangular blocky structure; firm; common fine roots; neutral; clear smooth boundary.
AB—18 to 22 inches; very dark gray (10YR 3/1) clay loam (about 32 percent clay), gray (10YR 5/1) dry; moderate fine subangular blocky structure; firm; few fine roots; slightly acid; clear smooth boundary.
Bg1—22 to 34 inches; dark gray (5Y 4/1) loam (about 25 percent clay); few fine prominent dark grayish brown (10YR 4/2) mottles; moderate medium subangular blocky structure; friable; few fine roots; slightly acid; about 2 percent fine pebbles; clear smooth boundary.
Bg2—34 to 42 inches; dark gray (5Y 4/1) clay loam (about 28 percent clay); common fine faint olive gray (5Y 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; few dark concretions of iron and manganese oxide; about 2 percent fine pebbles; slightly acid; clear smooth boundary.
Bg3—42 to 48 inches; dark gray (5Y 4/1) sandy loam (about 15 percent clay); common fine faint olive gray (5Y 5/2) mottles; moderate medium prismatic structure; friable; few dark concretions of iron and manganese oxide; about 3 percent fine pebbles; neutral; abrupt smooth boundary.
2Cg—48 to 60 inches; mottled grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) loam (about 23 percent clay); massive; firm; few dark concretions of iron and manganese oxide; about 5 percent fine pebbles; neutral.

The thickness of the solum ranges from 40 to 60 inches. The depth to lithologic discontinuity ranges from 30 to 50 inches.

The A horizon ranges from 16 to 24 inches in thickness. The Bg horizon is loam, clay loam, sandy clay loam, or sandy loam.

Colo Series

The Colo series consists of poorly drained, moderately permeable soils on flood plains and in drainageways in the uplands. These soils formed in alluvium. The native vegetation is tall prairie grasses. Slopes range from 0 to 5 percent.

Typical pedon of Colo silty clay loam, 0 to 2 percent slopes, in a nearly level, cultivated area of bottom land; 400 feet south and 1,450 feet west of the northeast corner of sec. 36, T. 80 N., R. 2 E.

Ap—0 to 11 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; neutral; abrupt wavy boundary.
A1—11 to 21 inches; black (10YR 2/1) silty clay loam (about 28 percent clay), dark gray (10YR 4/1) dry; weak fine granular structure; friable; neutral; gradual wavy boundary.
A2—21 to 31 inches; black (10YR 2/1) silty clay loam (about 28 percent clay), dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; neutral; gradual wavy boundary.
Bg1—31 to 40 inches; very dark gray (10YR 3/1) silty clay loam (about 30 percent clay), grayish brown (10YR 5/2) dry; few fine prominent dark yellowish brown (10YR 4/6) mottles; weak fine angular blocky structure; friable; neutral; gradual wavy boundary.
Bg2—40 to 46 inches; dark gray (10YR 4/1) silty clay loam (about 32 percent clay); few fine prominent yellowish brown (10YR 5/6) mottles; weak fine and medium angular blocky structure; friable; neutral; gradual wavy boundary.
Bg3—46 to 55 inches; grayish brown (2.5Y 5/2) silty clay loam (about 32 percent clay); very few fine prominent dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; friable; few fine dark concretions of manganese oxide; dark gray (10YR 4/1) fillings in root and worm channels; neutral; gradual wavy boundary.
Bg4—55 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam (about 32 percent clay); few fine prominent dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure; friable; few fine dark concretions of manganese oxide; dark gray (10YR 4/1) fillings in root and worm channels; neutral.

The thickness of the solum ranges from 40 to 60 inches. The mollic epipedon is 36 or more inches thick.

The A horizon has chroma of 0 to 2. It is silty clay loam. The content of clay between depths of 10 and 40

inches ranges from 27 to 35 percent but is as high as 38 percent in some thin layers. In some pedons stratified sand and silt are below a depth of 4 feet.

Dickinson Series

The Dickinson series consists of somewhat excessively drained, moderately rapidly permeable soils on uplands and stream terraces. These soils formed in sandy windblown material and sandy alluvium that has been reworked by wind. The native vegetation is prairie grasses. Slopes range from 0 to 18 percent.

Typical pedon of Dickinson fine sandy loam, 2 to 5 percent slopes, in an area of cropland; 900 feet west and 175 feet south of the northeast corner of sec. 21, T. 80 N., R. 4 E.

Ap—0 to 8 inches; very dark brown (10YR 2/2) fine sandy loam (about 16 percent clay), dark grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; common fine roots; neutral; clear smooth boundary.

A—8 to 16 inches; very dark grayish brown (10YR 3/2) fine sandy loam (about 14 percent clay), grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; common fine roots; slightly acid; clear smooth boundary.

Bw1—16 to 21 inches; dark brown (10YR 3/3) and brown (10YR 4/3) fine sandy loam (about 14 percent clay), brown (10YR 5/3) dry; weak very fine subangular blocky structure; very friable; many fine roots; slightly acid; gradual smooth boundary.

Bw2—21 to 26 inches; dark yellowish brown (10YR 4/4) fine sandy loam (about 14 percent clay); few faint (10YR 4/3) coatings on faces of peds; weak very fine subangular blocky structure; very friable; common fine roots; slightly acid; clear wavy boundary.

BC1—26 to 37 inches; yellowish brown (10YR 5/4) loamy fine sand (about 12 percent clay); weak fine subangular blocky structure; very friable; few fine roots; slightly acid; gradual wavy boundary.

BC2—37 to 47 inches; dark yellowish brown (10YR 4/6) loamy fine sand (about 8 percent clay); single grain; very friable; slightly acid; gradual wavy boundary.

C—47 to 60 inches; yellowish brown (10YR 5/6) loamy fine sand (about 6 percent clay); massive; very friable; slightly acid.

The thickness of the solum ranges from 40 to more than 60 inches. The thickness of the mollic epipedon ranges from 15 to 24 inches.

The A horizon has value and chroma of 2 or 3. The Bw horizon has value of 3 to 5 and chroma of 3 to 6. The upper part of the Bw horizon is sandy loam or fine sandy loam. The lower part is fine sandy loam, sandy loam, loamy fine sand, loamy sand, or fine sand.

The Dickinson soils in detailed soil map units 442C2, 442D2, and 442E2 are taxadjuncts to the Dickinson series because their dark surface layer is not thick enough to qualify as a mollic epipedon.

Dinsdale Series

The Dinsdale series consists of well drained, moderately permeable soils on ridges and side slopes in the uplands. These soils formed in 24 to 40 inches of loess and in the underlying glacial till. The native vegetation is tall prairie grasses. Slopes range from 2 to 9 percent.

Typical pedon of Dinsdale silty clay loam, 2 to 5 percent slopes, in an area of cropland; 525 feet east and 580 feet north of the southwest corner of sec. 23, T. 80 N., R. 3 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam (about 28 percent clay), dark grayish brown (10YR 5/2) dry; weak fine granular structure; friable; common fine roots; neutral; gradual smooth boundary.

A—8 to 13 inches, dark brown (10YR 3/3) silty clay loam (about 28 percent clay), dark grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

BA—13 to 17 inches; brown (10YR 4/3) silty clay loam (about 28 percent clay); dark brown (10YR 3/3) coatings on faces of peds; weak fine subangular blocky structure; friable; common fine roots; neutral; gradual wavy boundary.

Bt1—17 to 25 inches; brown (10YR 4/3) silty clay loam (about 32 percent clay); moderate fine subangular blocky structure; friable; common fine roots; common thin faint clay films on faces of peds; few fine concretions of iron and manganese oxide; slightly acid; gradual wavy boundary.

Bt2—25 to 35 inches; dark yellowish brown (10YR 4/4) silty clay loam (about 34 percent clay); brown (10YR 4/3) coatings on faces of peds; moderate medium angular blocky structure; friable; common faint clay films on faces of peds; few dark concretions of iron and manganese oxide; moderately acid; clear wavy boundary.

2Bt3—35 to 38 inches; yellowish brown (10YR 5/4) sandy loam (about 20 percent clay); weak fine and medium subangular blocky structure; very friable; few fine distinct yellowish brown (10YR 5/6) clay films on faces of peds; few small pebbles; slightly acid; abrupt smooth boundary.

2Bt4—38 to 48 inches; yellowish brown (10YR 5/6)

loam (about 22 percent clay); few fine distinct yellowish brown (10YR 5/8) and common fine distinct light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to weak medium angular blocky; firm; few distinct yellowish brown (10YR 5/4) clay films on faces of peds; few small pebbles; slightly acid; gradual wavy boundary.

2Bt5—48 to 60 inches; yellowish brown (10YR 5/6) clay loam (about 28 percent clay); yellowish brown (10YR 5/4) coatings on faces of peds; weak coarse prismatic structure; firm; few faint yellowish brown (10YR 5/4) clay films on faces of prisms; few small pebbles; neutral.

The thickness of the solum ranges from 50 to more than 60 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches. The depth to lithologic discontinuity ranges from 24 to 40 inches.

The A horizon has chroma of 1 to 3. It generally is silty clay loam but is silt loam in places. The 2B horizon has value of 4 or 5 and chroma of 4 to 8. In places a layer of sandy loam or loamy sand that is as much as 10 inches thick is between the loess and glacial till.

The Dinsdale soil in detailed soil map unit 377C2 is a taxadjunct to the Dinsdale series because its dark surface layer is not thick enough to qualify as a mollic epipedon.

Dockery Series

The Dockery series consists of somewhat poorly drained, moderately permeable soils on flood plains and in upland drainageways. These soils formed in alluvium. The native vegetation is tall prairie grasses. Slopes range from 0 to 5 percent.

Typical pedon of Dockery silt loam, 2 to 5 percent slopes, in an area of cropland; 95 feet east and 1,620 feet north of the southwest corner of sec. 1, T. 79 N., R. 4 E.

Ap—0 to 7 inches; brown (10YR 3/3) silt loam (about 25 percent clay), dark brown (10YR 6/3) dry; weak very fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

C1—7 to 18 inches; stratified dark brown (10YR 3/3), dark grayish brown (10YR 4/2), and brown (10YR 5/3) silt loam (about 25 percent clay); massive with horizontal cleavage planes; common fine roots; neutral; gradual wavy boundary.

C2—18 to 30 inches; stratified dark brown (10YR 3/3), dark grayish brown (10YR 4/2), and brown (10YR 5/3) silt loam (about 25 percent clay); few fine prominent strong brown (7.5YR 5/6) mottles; some very dark brown (10YR 2/2) stains on horizontal cleavage planes; friable; few fine roots; neutral; diffuse wavy boundary.

C3—30 to 48 inches; very dark grayish brown (10YR 3/2) silt loam (about 22 percent clay); few thin dark grayish brown (10YR 4/2) strata; few fine prominent brown (7.5YR 5/4) and strong brown (7.5YR 5/6) mottles; massive with horizontal cleavage planes; friable; few very fine roots; neutral; clear wavy boundary.

2Ab—48 to 60 inches; very dark brown (10YR 2/2) silty clay loam (about 29 percent clay); weak very fine granular structure; friable; neutral.

The solum and the surface layer range from 6 to 10 inches in thickness. The A horizon has value and chroma of 2 or 3. The C horizon has value of 3 to 6 and chroma of 2 to 4.

Downs Series

The Downs series consists of well drained, moderately permeable soils on convex ridgetops and side slopes in the uplands. These soils formed in loess. The native vegetation is mixed grasses and trees. Slopes range from 2 to 25 percent.

Typical pedon of Downs silt loam, 2 to 5 percent slopes, in an area of cropland; 280 feet north and 570 feet west of the southeast corner of sec. 26, T. 78 N., R. 2 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam (23 percent clay), grayish brown (10YR 5/2) dry; weak very fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

BE—8 to 12 inches; dark yellowish brown (10YR 4/4) silty clay loam (29 percent clay); common dark brown (10YR 3/3) coatings on faces of peds; moderate fine and very fine granular structure; friable; common fine roots; neutral; clear wavy boundary.

Bt1—12 to 19 inches; dark yellowish brown (10YR 4/4) silty clay loam (32 percent clay); moderate fine subangular blocky structure; friable; common fine roots; few faint brown (10YR 4/3) clay films on faces of peds; few faint light brownish gray (10YR 6/2 dry) silt coatings on faces of peds; slightly acid; gradual wavy boundary.

Bt2—19 to 27 inches; yellowish brown (10YR 5/4) silty clay loam (35 percent clay); few fine distinct strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular and angular blocky structure; friable; common fine roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few faint light brownish gray (10YR 6/2 dry) silt coatings on faces of peds; few fine dark

concretions of iron and manganese oxide; moderately acid; gradual wavy boundary.

Bt3—27 to 37 inches; brown (10YR 5/3) silty clay loam (34 percent clay); few fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular and angular blocky structure; friable; few fine roots; many faint clay films on faces of peds; few faint light brownish gray (10YR 6/2 dry) silt coatings on faces of peds; strongly acid; gradual wavy boundary.

Bt4—37 to 43 inches; mottled brown (10YR 5/3) and grayish brown (10YR 5/2) silty clay loam (32 percent clay); few fine faint and distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak medium prismatic structure parting to weak coarse subangular blocky; few fine roots; many faint clay films on faces of peds; few fine dark concretions of iron and manganese oxide; strongly acid; gradual wavy boundary.

BC—43 to 53 inches; mottled brown (10YR 5/3) and grayish brown (10YR 5/2) silty clay loam (29 percent clay); few fine faint and distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak medium prismatic structure; friable; few faint clay films on vertical faces of prisms; common dark concretions of iron and manganese oxide; strongly acid; gradual wavy boundary.

C—53 to 60 inches; mottled brown (10YR 5/3) and grayish brown (10YR 5/2) silty clay loam (27 percent clay); few fine faint and distinct yellowish brown (10YR 5/4 and 5/6) mottles; massive; friable; common fine dark concretions of iron and manganese oxide; strongly acid.

The thickness of the solum ranges from 42 to more than 60 inches. The thickness of the A or Ap horizon ranges from 6 to 9 inches.

The A or Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is silt loam or silty clay loam. The E horizon, if it occurs, has value of 3 or 4 and chroma of 2 or 3. The Bt horizon commonly has value of 4 or 5 and chroma of 3 or 4. The content of clay in the Bt horizon ranges from 27 to 35 percent. In some pedons loamy sand or sand is below a depth of 40 inches.

The Downs soils in detailed soil map units 162C2, 162C3, 162D2, 162D3, 162E2, 162E3, 162F2, 916C2, and 916D2 are taxadjuncts to the Downs series because they have a lighter colored surface layer than is definitive for the series.

Ely Series

The Ely series consists of somewhat poorly drained, moderately permeable soils on foot slopes. These soils formed in alluvium. The native vegetation is tall prairie grasses. Slopes range from 2 to 5 percent.

Typical pedon of Ely silty clay loam, 2 to 5 percent slopes, in a cultivated field; 1,325 feet north and 410 feet east of the southwest corner of sec. 18, T. 80 N., R. 2 E.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam (about 28 percent clay), very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A1—9 to 17 inches; black (10YR 2/1) silty clay loam (about 28 percent clay), very dark grayish brown (10YR 3/2) dry; moderate medium granular structure; friable; many fine roots; neutral; gradual smooth boundary.

A2—17 to 25 inches; very dark gray (10YR 3/1) silty clay loam (about 29 percent clay), grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; common fine roots; neutral; clear smooth boundary.

AB—25 to 29 inches; very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) silty clay loam (about 29 percent clay), dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; common fine roots; few faint very dark gray (10YR 3/1) coatings on faces of peds; neutral; clear smooth boundary.

Bg1—29 to 36 inches; brown (10YR 5/3) silty clay loam (about 30 percent clay); common fine faint dark grayish brown (10YR 4/2) mottles; weak fine subangular blocky structure; friable; few fine roots; few very dark gray (10YR 3/1) wormcasts; many faint dark grayish brown (10YR 4/2) coatings on faces of peds; few dark concretions of iron and manganese oxide; neutral; gradual wavy boundary.

Bg2—36 to 43 inches; brown (10YR 5/3) silty clay loam (about 30 percent clay); common fine faint dark grayish brown (10YR 4/2) and common fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak medium subangular blocky structure; friable; few fine roots; few dark concretions of iron and manganese oxide; dark grayish brown (10YR 4/2) coatings on faces of peds; neutral; gradual wavy boundary.

Bg3—43 to 51 inches; grayish brown (2.5Y 5/2) silty clay loam (about 30 percent clay); common fine prominent yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; friable; few dark concretions of iron and manganese oxide; dark grayish brown (10YR 4/2) coatings on faces of peds; neutral; gradual wavy boundary.

BC—51 to 60 inches; light brownish gray (2.5Y 6/2) silt loam (about 25 percent clay); common fine and

medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak medium prismatic structure; friable; few dark concretions of iron and manganese oxide; few thin distinct dark grayish brown (10YR 4/2) coatings on faces of peds; neutral.

The thickness of the solum ranges from 48 to more than 60 inches. The thickness of the mollic epipedon ranges from 24 to 36 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It generally is silty clay loam. The Bg horizon has value of 4 or 5 and chroma of 2 to 4. The content of clay in the Bg horizon ranges from 28 to 35 percent.

Exette Series

The Exette series consists of well drained, moderately permeable soils on upland side slopes. These soils formed in loess. The native vegetation is mixed prairie grasses and trees. Slopes range from 14 to 25 percent.

Typical pedon of Exette silt loam, 14 to 18 percent slopes, severely eroded, in an area of cropland; 125 feet south and 925 feet west of the northeast corner of sec. 10, T. 77 N., R. 2 E.

Ap—0 to 8 inches; mixed brown (10YR 4/3) and yellowish brown (10YR 5/4) silt loam (about 26 percent clay), pale brown (10YR 6/3) dry; weak fine granular structure; friable; neutral; clear smooth boundary.

Bw1—8 to 12 inches; yellowish brown (10YR 5/4) silt loam (about 20 percent clay); few fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; few fine dark concretions of oxide; neutral; gradual smooth boundary.

Bw2—12 to 20 inches; brown (10YR 5/3) silt loam (about 18 percent clay); many fine distinct grayish brown (2.5Y 5/2) and few fine faint yellowish brown (10YR 3/4) mottles; weak fine and medium subangular blocky structure; few fine dark concretions of oxide; neutral; gradual smooth boundary.

Bw3—20 to 38 inches; mottled brown (10YR 4/3) and yellowish brown (10YR 5/4) silt loam (about 18 percent clay); common fine faint grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; few fine dark concretions of oxide; neutral; gradual smooth boundary.

BC—38 to 46 inches; mottled brown (10YR 5/3) and yellowish brown (10YR 5/4) silt loam (about 17 percent clay); common fine faint grayish brown (10YR 5/2) mottles; weak medium prismatic structure; common fine dark concretions of oxide; neutral; gradual smooth boundary.

C—46 to 60 inches; grayish brown (10YR 5/2) silt loam (about 16 percent clay); many fine distinct yellowish brown (10YR 5/4) and common medium distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; common fine dark concretions of oxide; slightly alkaline.

The thickness of the solum ranges from 30 to 55 inches. The Ap horizon has chroma of 2 or 3. The Bw and BC horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4.

Fayette Series

The Fayette series consists of well drained soils on convex ridgetops and side slopes in the uplands. These soils formed in loess. They are moderately permeable in the upper part and moderately rapidly permeable in the lower part. The native vegetation is deciduous trees. Slopes range from 2 to 40 percent.

Typical pedon of Fayette silt loam, 2 to 5 percent slopes, moderately eroded, in an area of cropland; 1,260 feet west and 1,630 feet south of the northeast corner of sec. 18, T. 77 N., R. 2 E.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam (22 percent clay), pale brown (10YR 6/3) dry; some streaks and pockets of dark yellowish brown (10YR 4/4) subsoil material; weak very fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Bt1—6 to 10 inches; dark yellowish brown (10YR 4/4) silty clay loam (29 percent clay); brown (10YR 4/3) coatings on faces of peds; weak fine granular structure; friable; few faint clay films on faces of peds; common fine roots; moderately acid; clear wavy boundary.

Bt2—10 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam (35 percent clay); moderate fine angular and subangular blocky structure; friable; many faint clay films on faces of peds; few faint pale brown (10YR 6/3 dry) silt coatings on faces of peds; common fine roots; moderately acid; clear wavy boundary.

Bt3—15 to 21 inches; yellowish brown (10YR 5/4) silty clay loam (35 percent clay); moderate fine and medium angular and subangular blocky structure; friable; many faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few faint pale brown (10YR 6/3 dry) silt coatings on faces of peds; few fine roots; few fine dark concretions of iron and

manganese oxide; moderately acid; clear wavy boundary.

Bt4—21 to 31 inches; yellowish brown (10YR 5/4) silty clay loam (33 percent clay); few fine faint brown (10YR 5/3) mottles; moderate medium subangular blocky structure; friable; few faint clay films on faces of peds; pale brown (10YR 6/3 dry) silt coatings on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; moderately acid; clear wavy boundary.

Bt5—31 to 37 inches; yellowish brown (10YR 5/4) silty clay loam (33 percent clay); few fine distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few faint clay films on faces of peds; few fine roots; common fine dark concretions of iron and manganese oxide; moderately acid; gradual wavy boundary.

Bt6—37 to 46 inches; yellowish brown (10YR 5/4) silty clay loam (29 percent clay); common fine distinct yellowish brown (10YR 5/6) and many fine distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few faint clay films on faces of peds; common fine roots; common fine dark concretions of iron and manganese oxide; strongly acid; gradual wavy boundary.

BC—46 to 55 inches; yellowish brown (10YR 5/4) silty clay loam (27 percent clay); common fine distinct yellowish brown (10YR 5/6) and many fine distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure; friable; common fine dark concretions of iron and manganese oxide; moderately acid; gradual wavy boundary.

C—55 to 60 inches; mottled yellowish brown (10YR 5/4) silty clay loam (27 percent clay); common fine distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; massive; friable; common fine dark concretions of iron and manganese oxide; moderately acid.

The thickness of the solum ranges from 36 to more than 60 inches. The A horizon has value of 2 or 3 and chroma of 1 or 2. It ranges from 1 to 4 inches in thickness. The Ap horizon has value of 4 and chroma of 2 or 3. It typically is silt loam but is silty clay loam in severely eroded areas. The Bt horizon contains 27 to 35 percent clay.

Flagler Series

The Flagler series consists of somewhat excessively drained soils on stream terraces. These soils formed in alluvium. Permeability is moderately rapid in the solum and very rapid in the substratum. The native vegetation is tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Flagler sandy loam, 0 to 2 percent slopes, in an area of cropland; 1,260 feet south and 200 feet east of the northwest corner of sec. 13, T. 80 N., R. 4 E.

Ap—0 to 9 inches; very dark brown (10YR 2/2) sandy loam (about 15 percent clay), dark grayish brown (10YR 4/2) dry; weak very fine granular structure; very friable; many fine roots; neutral; clear smooth boundary.

A—9 to 16 inches; very dark grayish brown (10YR 3/2) sandy loam (about 15 percent clay), grayish brown (10YR 5/2) dry; common very dark brown (10YR 2/2) coatings on faces of peds; moderate very fine granular structure; very friable; common fine roots; neutral; clear smooth boundary.

Bw1—16 to 22 inches; dark yellowish brown (10YR 4/4) sandy loam (about 13 percent clay); common fine distinct dark brown (7.5YR 4/4) mottles; weak very fine subangular blocky structure; very friable; common fine roots; many faint dark brown (10YR 3/3) organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bw2—22 to 30 inches; dark brown (7.5YR 3/4), brown (7.5YR 4/4), and dark yellowish brown (10YR 4/4) sandy loam (about 12 percent clay); weak fine subangular blocky structure; very friable; common fine roots; few fine stains and accumulations of dark reddish brown (5YR 2/2) soil material; few fine dark concretions of manganese oxide; moderately acid; gradual wavy boundary.

2C1—30 to 44 inches; dark yellowish brown (10YR 4/4) and strong brown (7.5YR 4/6) loamy sand (about 8 percent clay); weak medium subangular blocky structure; very friable; few fine roots; about 2 percent fine pebbles; moderately acid; clear wavy boundary.

2C2—44 to 60 inches; yellowish brown (10YR 5/4), brown (7.5YR 4/4), and strong brown (7.5YR 4/6) sand (about 6 percent clay); single grain; very friable; few fine roots; few fine stains and accumulations of dark reddish brown (5YR 2/2) soil material; about 6 percent fine pebbles; moderately acid.

The thickness of the solum ranges from 30 to 50 inches. The thickness of the mollic epipedon ranges from 16 to 24 inches.

The A horizon has chroma of 1 or 2. It typically is sandy loam, but in some pedons it is fine sandy loam. The Bw horizon has value of 3 to 5 and chroma of 3 to 6. The C horizon has value and chroma of 4 to 6. It is sand, gravelly sand, or loamy sand.

Gara Series

The Gara series consists of well drained, moderately slowly permeable soils on side slopes in the uplands. The slopes are dissected by drainageways. These soils formed in glacial till. The native vegetation is mixed prairie grasses and deciduous trees. Slopes range from 9 to 25 percent.

Typical pedon of Gara loam, 14 to 18 percent slopes, moderately eroded, in a pastured area; 1,000 feet north and 200 feet west of the southeast corner of sec. 26, T. 78 N., R. 2 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loam (about 26 percent clay), grayish brown (10YR 5/2) dry; some streaks and pockets of dark yellowish brown (10YR 4/4) subsoil material; moderate fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bt1—7 to 11 inches; yellowish brown (10YR 5/4) clay loam (about 34 percent clay); few faint dark yellowish brown (10YR 4/4) coatings on faces of peds; moderate very fine subangular blocky structure; friable; many faint clay films on faces of peds; many fine roots; few fine dark concretions of iron and manganese oxide; dark brown (10YR 3/3) coatings in root channels; few pebbles; slightly acid; clear wavy boundary.

Bt2—11 to 15 inches; yellowish brown (10YR 5/4) clay loam (about 33 percent clay); moderate fine subangular blocky structure; firm; many faint clay films on faces of peds; few fine dark concretions of iron and manganese oxide; few pebbles; slightly acid; clear wavy boundary.

Bt3—15 to 24 inches; yellowish brown (10YR 5/4) clay loam (about 30 percent clay); few fine prominent strong brown (7.5YR 5/6 and 5/8) mottles; moderate fine and medium subangular blocky structure; firm; many faint clay films on faces of peds; few fine dark concretions of iron and manganese oxide; few pebbles; slightly acid; clear wavy boundary.

Bt4—24 to 32 inches; yellowish brown (10YR 5/4) clay loam (about 29 percent clay); few fine prominent strong brown (7.5YR 5/6 and 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common faint clay films on faces of peds; few fine dark concretions of iron and manganese oxide; few pebbles; moderately acid; clear wavy boundary.

BC—32 to 43 inches; yellowish brown (10YR 5/4) clay loam (about 29 percent clay); few fine prominent strong brown (7.5YR 5/6 and 5/8) and distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine dark concretions of iron and manganese oxide; few pebbles; moderately acid; abrupt wavy boundary.

C—43 to 60 inches; yellowish brown (10YR 5/4) clay loam (about 29 percent clay); few fine prominent strong brown (7.5YR 5/6 and 5/8) and distinct grayish brown (10YR 5/2) mottles; massive; firm; few fine dark concretions of iron and manganese oxide; few pebbles; slight effervescence; neutral.

The thickness of the solum ranges from 36 to 60 inches. The thickness of the A horizon ranges from 6 to 10 inches.

The A or Ap horizon has chroma of 1 to 3. It is loam or clay loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The C horizon has value of 4 or 5 and chroma of 4 to 6. The content of clay in the C horizon ranges from 27 to 35 percent.

The Gara soils in detailed soil map units 179E3 and 179F3 are taxadjuncts to the Gara series because they have a lighter colored surface layer than is definitive for the series.

Garwin Series

The Garwin series consists of poorly drained, moderately permeable soils on concave slopes at the head of upland drainageways, on broad ridgetops, and on stream benches. These soils formed in loess. The native vegetation is tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Garwin silty clay loam, 0 to 2 percent slopes, in an area of cropland; 400 feet east and 25 feet south of the northwest corner of sec. 27, T. 79 N., R. 2 E.

Ap—0 to 9 inches; black (N 2/0) silty clay loam (about 32 percent clay), dark gray (10YR 3/1) dry; weak fine granular structure; friable; neutral; gradual smooth boundary.

A—9 to 18 inches; black (10YR 2/1) silty clay loam (about 32 percent clay), dark grayish brown (10YR 4/2) dry; weak very fine subangular blocky structure; friable; few faint light gray (10YR 7/2 dry) silt coatings on faces of peds; neutral; gradual smooth boundary.

Bg1—18 to 26 inches; dark gray (10YR 4/1) silty clay loam (about 33 percent clay); few fine prominent dark brown (7.5YR 3/4) and distinct yellowish brown (10YR 5/4) mottles; weak very fine subangular blocky structure; friable; many faint clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; very dark gray (10YR 3/1) coatings on faces of peds; neutral; gradual wavy boundary.

Bg2—26 to 31 inches; dark gray (10YR 4/1) silty clay loam (about 33 percent clay); few fine prominent dark brown (7.5YR 3/4) and many medium distinct yellowish brown (10YR 5/4) mottles; moderate fine and medium subangular blocky structure; friable; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; very dark gray (10YR 3/1) coatings on faces of peds; neutral; gradual wavy boundary.

Bg3—31 to 40 inches; grayish brown (2.5Y 5/2) silty clay loam (about 32 percent clay); common fine distinct dark gray (10YR 4/1) and prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine dark concretions of manganese oxide; very dark gray (10YR 3/1) coatings on faces of peds; neutral; gradual wavy boundary.

Bg4—40 to 49 inches; grayish brown (2.5Y 5/2) silty clay loam (about 32 percent clay); few fine distinct dark gray (10YR 4/1) and common fine prominent yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure; friable; few fine dark concretions of manganese oxide; neutral; gradual wavy boundary.

Bg5—49 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam (about 29 percent clay); few fine distinct dark gray (10YR 4/1) and prominent strong brown (7.5YR 5/8) and common fine prominent yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure; friable; few fine dark concretions of manganese oxide; neutral.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the mollic epipedon ranges from 13 to 24 inches.

The A horizon has value of 2 or 3 and chroma of 0 or 1. The Bg horizon has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 1 or 2. The content of clay in the Bg horizon ranges from 29 to 35 percent. The Cg horizon, if it occurs, has colors similar to those of the Bg horizon.

Gosport Series

The Gosport series consists of moderately well drained, very slowly permeable soils on side slopes in the uplands. These soils formed in material weathered from acid shale. The native vegetation is deciduous trees. Slopes range from 25 to 40 percent.

Typical pedon of Gosport silt loam, 25 to 40 percent slopes, in an area of timber; 650 feet west and 2,550 feet south of the northeast corner of sec. 16, T. 77 N., R. 2 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam (about 25 percent clay), grayish brown (10YR 5/2) dry; weak fine granular structure; friable; slightly acid; clear wavy boundary.

E—7 to 11 inches; yellowish brown (10YR 5/4) silt loam (about 23 percent clay); weak very fine subangular blocky and very thin platy structure; friable; slightly acid; gradual wavy boundary.

Bw1—11 to 17 inches; yellowish brown (10YR 5/4) silty clay (about 42 percent clay); few faint yellowish brown (10YR 5/6) and few prominent light brownish gray (10YR 6/2) mottles; weak very fine angular blocky structure; very firm; strongly acid; gradual wavy boundary.

Bw2—17 to 28 inches; brown (10YR 5/3) silty clay (about 45 percent clay); few fine distinct yellowish brown (10YR 5/6) and gray (5Y 5/1) mottles; very weak fine angular blocky structure; very firm; very strongly acid; gradual wavy boundary.

Bw3—28 to 38 inches; brown (10YR 5/3) and yellowish brown (10YR 5/6) silty clay (about 45 percent clay); few fine prominent gray (5Y 5/1) mottles; very weak fine angular blocky structure; very firm; very strongly acid; gradual wavy boundary.

Cr1—38 to 46 inches; mottled very dark gray (5Y 3/1) and dark gray (5Y 4/1) clay shale bedrock.

Cr2—46 to 60 inches; mottled gray (5Y 5/1) and dark gray (5Y 4/1) clay shale bedrock.

The thickness of the solum and the depth to weathered shale bedrock range from 20 to 40 inches. The gray colors in the Bw horizon are relict features and are not indicative of the present drainage conditions.

The Ap horizon has chroma of 2 or 3. It is silt loam or loam and generally is 6 to 9 inches thick. The E horizon, if it occurs, has value of 4 or 5 and chroma of 2 to 4. It is loam or silt loam. The Bw horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 3 or 4.

Kenyon Series

The Kenyon series consists of moderately well drained, moderately permeable soils on ridgetops and side slopes in the uplands. These soils formed in loamy sediments and in the underlying glacial till. The native vegetation is tall prairie grasses. Slopes range from 2 to 14 percent.

Typical pedon of Kenyon loam, 2 to 5 percent slopes, in an area of cropland; 350 feet west and 140 feet north of the southeast corner of sec. 17, T. 80 N., R. 3 E.

Ap—0 to 8 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; some mixed areas of brown (10YR 4/3) subsoil material; weak

fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

A1—8 to 11 inches; very dark grayish brown (10YR 3/2) loam (about 24 percent clay), brown (10YR 5/3) dry; weak fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

A2—11 to 18 inches; dark brown (10YR 3/3) loam (about 24 percent clay), brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; common fine roots; accumulation of few fine pebbles at lower boundary; slightly acid; clear smooth boundary.

2Bw1—18 to 25 inches; brown (10YR 4/3) loam (about 23 percent clay); moderate fine and medium subangular blocky structure; friable; common fine roots; few fine pebbles; few dark oxides; slightly acid; abrupt smooth boundary.

2Bw2—25 to 35 inches; yellowish brown (10YR 5/4) loam (about 25 percent clay); few fine distinct dark grayish brown (10YR 4/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; few fine pebbles; few fine dark oxides; moderately acid; gradual wavy boundary.

2Bw3—35 to 45 inches; yellowish brown (10YR 5/4) loam (about 26 percent clay); few fine faint yellowish brown (10YR 5/6) and few fine distinct dark grayish brown (10YR 4/2) mottles; weak coarse prismatic structure; firm; few fine pebbles; few fine dark oxides; slightly acid; gradual wavy boundary.

2Bw4—45 to 60 inches; yellowish brown (10YR 5/4) loam (about 26 percent clay); few fine distinct dark grayish brown (10YR 4/2) mottles; weak coarse prismatic structure; firm; few fine pebbles; few fine dark oxides; slightly acid.

The thickness of the solum ranges from 50 to more than 60 inches. Depth to the loamy glacial till ranges from 14 to 24 inches.

The A horizon has value and chroma of 2 or 3. The 2C horizon, if it occurs, is similar to the 2B horizon but may have a greater abundance of distinct gray mottles.

The Kenyon soils in detailed soil map units 83C2, 83D2, and 83D3 are taxadjuncts to the Kenyon series because their surface layer is not dark enough to qualify as a mollic epipedon.

Killduff Series

The Killduff series consists of moderately well drained, moderately permeable soils on side slopes in the uplands. These soils formed in loess. The native vegetation is tall prairie grasses. Slopes range from 5 to 14 percent.

Typical pedon of Killduff silty clay loam, 9 to 14 percent slopes, moderately eroded, in an area of cropland; 100 feet north and 1,900 feet west of the southeast corner of sec. 33, T. 79 N., R. 5 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) silty clay loam (about 30 percent clay), pale brown (10YR 6/3) dry; some streaks and pockets of brown (10YR 4/3) and yellowish brown (10YR 5/4) subsoil material; weak fine and medium subangular blocky structure; friable; common fine roots; neutral; abrupt smooth boundary.

Bw1—7 to 12 inches; mottled yellowish brown (10YR 5/4, 5/6, and 5/8) and light brownish gray (2.5Y 6/2) silty clay loam (about 32 percent clay); weak fine and medium subangular blocky structure; friable; common fine and very fine roots; few faint clay films; slightly acid; clear smooth boundary.

Bw2—12 to 19 inches; mottled light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/4, 5/6, and 5/8) silty clay loam (about 30 percent clay); weak medium subangular blocky structure; friable; common very fine roots; few faint clay films; few dark concretions of manganese oxide; neutral; gradual smooth boundary.

Bw3—19 to 30 inches; mottled yellowish brown (10YR 5/4, 5/6, and 5/8) and light brownish gray (2.5Y 6/2) silt loam (about 26 percent clay); weak medium prismatic structure parting to weak medium subangular blocky; friable; few dark concretions of manganese oxide; neutral; gradual smooth boundary.

BC—30 to 38 inches; mottled yellowish brown (10YR 5/4, 5/6, and 5/8) and light brownish gray (2.5Y 6/2) silt loam (about 26 percent clay); weak medium prismatic structure; friable; few dark concretions of iron and manganese oxide; neutral; gradual smooth boundary.

2C—38 to 60 inches; mottled yellowish brown (10YR 5/4, 5/6, and 5/8) and light brownish gray (2.5Y 6/2) silt loam (about 26 percent clay); massive; common dark concretions of iron oxide; neutral.

The thickness of the solum ranges from 30 to 55 inches. The thickness of the surface layer ranges from 6 to 10 inches.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The Bw horizon has hue of 10YR, 2.5Y, and 5Y, value of 4 to 6, and chroma of 2 to 8. The gray colors are relict features and are not indicative of present drainage conditions.

Klinger Series

The Klinger series consists of somewhat poorly drained, moderately permeable soils on upland

ridgetops. These soils formed in 24 to 40 inches of loess and in the underlying glacial till. The native vegetation is tall prairie grass. Slopes range from 0 to 3 percent.

Typical pedon of Klinger silty clay loam, 0 to 3 percent slopes, in an area of cropland; 1,500 feet west and 700 feet north of the center of sec. 26, T. 80 N., R. 3 E.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam (about 28 percent clay), dark gray (10YR 4/1) dry; moderate fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

A—9 to 14 inches; very dark brown (10YR 2/2) silty clay loam (about 28 percent clay), dark grayish brown (10YR 4/2) dry; few thin faint black (10YR 2/1) coatings on faces of peds; moderate fine granular structure; friable; common fine roots; slightly acid; clear smooth boundary.

AB—14 to 19 inches; dark brown (10YR 3/3) silty clay loam (about 28 percent clay), grayish brown (10YR 5/2) dry; common faint very dark brown (10YR 2/2) coatings on faces of peds; weak very fine subangular blocky structure; friable; common fine roots; few very dark brown (10YR 2/2) fillings in root channels; slightly acid; clear smooth boundary.

Bg1—19 to 26 inches; mottled dark grayish brown (10YR 4/2) and brown (10YR 4/3) silty clay loam (about 30 percent clay); few fine distinct yellowish brown (10YR 5/4) mottles; moderate very fine subangular blocky structure; friable; few fine roots; few dark concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

Bg2—26 to 37 inches; mottled grayish brown (10YR 5/2) and brown (10YR 5/3) silty clay loam (about 30 percent clay); many faint dark grayish brown (10YR 4/2) coatings on vertical faces of peds; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; friable; few fine roots; few dark concretions of iron and manganese oxide; slightly acid; abrupt smooth boundary.

Bw—37 to 39 inches; yellowish brown (10YR 5/4) loamy sand (about 10 percent clay); weak medium prismatic structure; very friable; few dark concretions of iron and manganese oxide; slightly acid; abrupt smooth boundary.

2BC—39 to 52 inches; yellowish brown (10YR 5/4) loam (about 26 percent clay); weak medium prismatic structure; firm; neutral; clear wavy boundary.

2C—52 to 60 inches; yellowish brown (10YR 5/4) loam (about 26 percent clay); few fine distinct grayish brown (10YR 5/2) and few fine faint yellowish brown (10YR 5/6) mottles; massive; firm; few dark concretions of iron and manganese oxide; neutral.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the loess ranges from 24 to 40 inches. The mollic epipedon ranges from 12 to 20 inches in thickness.

The A horizon has chroma of 1 to 3. It generally is silty clay loam but is silt loam in some pedons. The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3.

Lamont Series

The Lamont series consists of well drained, moderately rapidly permeable soils on uplands. These soils formed in sandy eolian deposits. The native vegetation is deciduous trees. Slopes range from 5 to 25 percent.

Typical pedon of Lamont fine sandy loam, in a pastured area of Chelsea-Lamont-Fayette, sandy substratum, complex, 9 to 18 percent slopes; 850 feet east and 2,380 feet north of the southwest corner of sec. 28, T. 80 N., R. 5 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam (about 12 percent clay); weak very fine granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.

Bt1—9 to 14 inches; brown (10YR 4/3) fine sandy loam (about 16 percent clay); weak very fine granular structure; very friable; common fine roots; few faint clay films on sand grains; some clay bridges between sand grains; moderately acid; clear smooth boundary.

Bt2—14 to 21 inches; dark yellowish brown (10YR 4/4) sandy clay loam (about 21 percent clay); weak medium subangular blocky structure; friable; few fine roots; many faint clay films on faces of peds; moderately acid; gradual smooth boundary.

Bt3—21 to 32 inches; brown (7.5YR 4/4) fine sandy loam (about 18 percent clay); weak medium subangular blocky structure; very friable; few fine roots; many faint clay films on faces of peds and clay bridges between sand grains; moderately acid; gradual smooth boundary.

Bt4—32 to 48 inches; strong brown (7.5YR 5/6) fine sandy loam (about 15 percent clay); weak medium subangular blocky structure; very friable; few faint clay films on faces of peds; some clay bridges between sand grains; moderately acid; gradual smooth boundary.

E and Bt—48 to 60 inches; yellowish brown (10YR 5/6) fine sand (about 5 percent clay); single grain; loose;

0.5-inch-thick band of loamy sand at depths of 50 and 56 inches; moderately acid.

The thickness of the solum ranges from 40 to about 60 inches. The A or Ap horizon has value of 3 or 4 and chroma of 2 or 3. The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It generally is fine sandy loam, but the range includes sandy loam and sandy clay loam.

Lawler Series

The Lawler series consists of somewhat poorly drained soils on stream terraces. These soils formed in loamy and sandy alluvial sediments. Permeability is moderate in the solum and very rapid in the substratum. The native vegetation is tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Lawler loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes, in an area of cropland; 1,110 feet south and 240 feet west of the northeast corner of sec. 14, T. 80 N., R. 4 E.

Ap—0 to 8 inches; black (10YR 2/1) loam (about 26 percent clay), dark gray (10YR 4/1) dry; moderate very fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

A—8 to 15 inches; very dark grayish brown (10YR 3/2) clay loam (about 28 percent clay), dark grayish brown (10YR 4/2) dry; moderate fine granular structure; friable; common fine roots; slightly acid; clear smooth boundary.

BA—15 to 23 inches; dark grayish brown (10YR 4/2) clay loam (about 28 percent clay); many faint very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine prominent strong brown (7.5YR 4/6) mottles; moderate very fine subangular blocky structure; friable; common fine roots; slightly acid; clear smooth boundary.

Bw—23 to 28 inches; dark grayish brown (10YR 4/2) sandy clay loam (about 28 percent clay); few faint very dark grayish brown (10YR 3/2) coatings on faces of peds; common fine and medium distinct strong brown (7.5YR 4/6) mottles; moderate fine subangular blocky structure; friable; common fine roots; few fine dark concretions of manganese oxide; moderately acid; abrupt smooth boundary.

2C1—28 to 45 inches; dark grayish brown (10YR 4/2) and strong brown (7.5YR 4/6) loamy coarse sand (about 8 percent clay); massive; very friable; few fine roots; slightly acid; gradual wavy boundary.

2C2—45 to 55 inches; dark grayish brown (10YR 4/2) loamy coarse sand (about 4 percent clay); few fine and medium prominent strong brown (7.5YR 5/6) mottles; 1 to 3 percent fine and medium pebbles; single grain; loose; slightly acid; gradual wavy boundary.

2C3—55 to 60 inches; dark grayish brown (10YR 4/2) and strong brown (7.5YR 4/6) loamy coarse sand (about 6 percent clay); single grain; loose; slightly acid.

The thickness of the solum ranges from 24 to 32 inches. The thickness of the mollic epipedon ranges from 15 to 24 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is loam or clay loam that has a high content of sand. The Bw horizon has hue of 2.5Y or 10YR, value of 4 to 6, and chroma of 2 to 6. The 2C horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 8, and chroma of 1 to 6.

Lawson Series

The Lawson series consists of somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in alluvium. The native vegetation is tall prairie grass. Slopes range from 0 to 2 percent.

Typical pedon of Lawson silt loam, 0 to 2 percent slopes, in an area of cropland; 1,340 feet north and 1,580 feet east of the southwest corner of sec. 18, T. 78 N., R. 5 E.

Ap—0 to 8 inches; black (10YR 2/1) silt loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; friable; neutral; abrupt smooth boundary.

A1—8 to 24 inches; black (10YR 2/1) silt loam (about 20 percent clay), grayish brown (10YR 5/2) dry; weak fine granular structure; friable; neutral; gradual wavy boundary.

A2—24 to 35 inches; very dark gray (10YR 3/1) silt loam (about 20 percent clay), grayish brown (10YR 5/2) dry; weak fine granular structure; friable; neutral; gradual wavy boundary.

C1—35 to 52 inches; stratified very dark gray (10YR 3/1) and black (10YR 2/1) silt loam (about 26 percent clay); few thin dark gray (10YR 4/1) strata; moderate fine granular structure; friable; neutral; gradual wavy boundary.

C2—52 to 60 inches; dark grayish brown (10YR 4/2) silt loam (about 26 percent clay); few fine faint grayish brown (10YR 5/2) mottles; massive with some horizontal cleavage planes; friable; neutral.

The A horizon ranges from 24 to 36 inches in thickness. It has value of 2 or 3 and chroma of 1 or 2. The C horizon has value of 2 to 6 and chroma of 1 to 3. It is silt loam or silty clay loam.

Lindley Series

The Lindley series consists of well drained, moderately slowly permeable soils on convex side slopes in the uplands. These soils formed in glacial till. The native vegetation is deciduous trees. Slopes range from 14 to 40 percent.

Typical pedon of Lindley loam, 25 to 40 percent slopes, in a pastured area; 1,400 feet west and 100 feet south of the northeast corner of sec. 11, T. 77 N., R. 2 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) and brown (10YR 5/3) loam (about 23 percent clay); very dark grayish brown (10YR 3/2) coatings on faces of some peds; moderate fine granular structure; friable; few very fine roots; about 2 percent very fine pebbles; neutral; clear smooth boundary.

Bt1—6 to 12 inches; yellowish brown (10YR 5/4) clay loam (about 28 percent clay); brown (10YR 4/3) coatings on faces of peds; moderate very fine subangular blocky structure; friable; few faint clay films; few very fine roots; about 2 percent very fine pebbles; slightly acid; gradual wavy boundary.

Bt2—12 to 18 inches; yellowish brown (10YR 5/6) clay loam (about 32 percent clay); strong very fine and fine angular blocky structure; friable; few very fine roots; few distinct yellowish brown (10YR 5/4) clay films on faces of peds; gray (10YR 7/1 dry) silt coatings on faces of peds; about 3 percent fine pebbles; slightly acid; clear wavy boundary.

Bt3—18 to 24 inches; yellowish brown (10YR 5/6) clay loam (about 32 percent clay); strong fine angular blocky structure; firm; very few very fine roots; few distinct yellowish brown (10YR 5/4) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; about 6 percent fine pebbles; slightly acid; gradual wavy boundary.

Bt4—24 to 31 inches; yellowish brown (10YR 5/6) clay loam (about 30 percent clay); strong medium prismatic structure parting to strong medium angular blocky; firm; very few very fine roots; few distinct yellowish brown (10YR 3/4) clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; about 6 percent fine pebbles; moderately acid; gradual wavy boundary.

Bt5—31 to 41 inches; yellowish brown (10YR 5/6) clay loam (about 30 percent clay); few fine distinct yellowish brown (10YR 5/8) and very few fine prominent dark brown (7.5YR 3/4) mottles; strong medium prismatic structure; firm; few distinct yellowish brown (10YR 5/4) clay films on faces of peds; common distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; about 6 percent fine and a few ¾-inch pebbles; moderately acid; gradual wavy boundary.

Bt6—41 to 48 inches; yellowish brown (10YR 5/4) clay loam (about 30 percent clay); few fine distinct yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure; firm; few faint clay films on faces of peds; black (N 2/0) stains on faces of peds; moderately acid; gradual wavy boundary.

BC—48 to 60 inches; yellowish brown (10YR 5/4) clay loam (about 28 percent clay); few fine faint yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; firm; few fine dark concretions of iron and manganese; slightly acid.

The thickness of the solum ranges from 36 to more than 60 inches. The Ap horizon has value of 4 or 5 and chroma of 2 to 5. The A horizon is 3 to 5 inches thick. It has value of 3 or 4 and chroma of 1 or 2. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is clay loam or loam.

Marshan Series

The Marshan series consists of poorly drained soils on stream terraces. These soils formed in loamy and sandy alluvial sediments. Permeability is moderate in the solum and very rapid in the substratum. The native vegetation is tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Marshan clay loam, 24 to 32 inches to sand or gravel, 0 to 2 percent slopes, in an area of cropland; 1,225 feet north and 200 feet east of the southwest corner of sec. 13, T. 80 N., R. 4 E.

Ap—0 to 9 inches; black (10YR 2/1) clay loam (about 29 percent clay), dark gray (10YR 4/1) dry; moderate very fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

A—9 to 16 inches; very dark gray (10YR 3/1) loam (about 26 percent clay), gray (10YR 5/1) dry; moderate fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

Bg—16 to 24 inches; dark gray (10YR 4/1) loam (about 26 percent clay); moderate very fine subangular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.

2BCg—24 to 28 inches; dark gray (10YR 4/1) sandy loam (about 19 percent clay); moderate fine subangular blocky structure; very friable; few fine roots; slightly acid; clear smooth boundary.

2Cg1—28 to 37 inches; grayish brown (10YR 5/2) coarse sand (about 4 percent clay); single grain;

very friable; about 5 percent fine pebbles; moderately acid; gradual wavy boundary.
2Cg2—37 to 60 inches; grayish brown (10YR 5/2) coarse sand (about 4 percent clay); single grain; loose; about 5 percent fine pebbles; slightly acid.

The thickness of the solum ranges from 24 to 36 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches. The depth to sand and gravel typically ranges from 24 to 32 inches.

The Ap horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It typically is clay loam, but the range includes silty clay loam and silt loam. The Bg horizon has hue of 5Y, 2.5Y, or 10YR, value of 4 or 5, and chroma of 1 or 2. The 2C horizon is coarse sand or gravelly sand.

Maxfield Series

The Maxfield series consists of poorly drained, moderately permeable soils on upland ridgetops. These soils formed in 24 to 40 inches of loess and in the underlying glacial till. The native vegetation is tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Maxfield silty clay loam, 0 to 2 percent slopes, in an area of cropland; 500 feet west and 75 feet south of the northeast corner of sec. 27, T. 80 N., R. 3 E.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam (about 28 percent clay), dark gray (10YR 4/1) dry; moderate fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.
A1—9 to 15 inches; black (N 2/0) silty clay loam (about 30 percent clay), dark gray (10YR 4/1) dry; few fine distinct dark gray (10YR 4/1) mottles; moderate fine granular structure; friable; common fine roots; neutral; clear smooth boundary.
A2—15 to 22 inches; black (10YR 2/1) silty clay loam (about 30 percent clay), very dark gray (10YR 4/1) dry; few fine distinct grayish brown (2.5Y 4/2) mottles; moderate fine granular structure; friable; few fine roots; neutral; clear smooth boundary.
Bg1—22 to 29 inches; dark grayish brown (2.5Y 4/2) silty clay loam (about 32 percent clay); many distinct very dark grayish brown (10YR 3/2) coatings on faces of peds; weak fine subangular blocky structure; friable; few fine roots; few dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.
Bg2—29 to 38 inches; mottled grayish brown (2.5Y 5/2) and brown (10YR 5/3) silty clay loam (about 30 percent clay); few fine prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; few fine roots; few dark concretions of iron and manganese oxide; neutral; abrupt smooth boundary.
2Bg3—38 to 52 inches; mottled dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4 and 5/6) loam (about 26 percent clay); few fine distinct yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few dark concretions of iron and manganese oxide; neutral; gradual wavy boundary.
2C—52 to 60 inches; yellowish brown (10YR 5/4) loam (about 24 percent clay); massive; firm; few dark concretions of iron and manganese oxide; neutral.

The thickness of the solum ranges from 36 to 60 inches. The thickness of the mollic epipedon ranges from 14 to 24 inches. The loess ranges from 24 to 40 inches in thickness.

The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 to 3. The upper part of the Bg horizon typically is silty clay loam, but the range includes silt loam. The lower part typically is loam, but in some pedons thin strata of sandy loam or loamy sand separate the loess and till.

Mula Series

The Mula series consists of well drained, moderately permeable soils on highly eroded side slopes in the uplands. These soils formed in recently exposed loess. The native vegetation is deciduous trees. Slopes range from 14 to 25 percent.

Typical pedon of Mula silt loam, 14 to 18 percent slopes, severely eroded, in an area of cropland; 450 feet north and 250 feet east of the center of sec. 22, T. 79 N., R. 5 E.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam (about 18 percent clay), light brownish gray (10YR 6/2) dry; 10 to 15 percent streaks and pockets of dark brown (10YR 3/3) material from the original surface soil; weak very fine granular structure; friable; common fine roots; few secondary carbonates; moderate effervescence; mildly alkaline; abrupt smooth boundary.
Bw1—5 to 8 inches; grayish brown (2.5Y 5/2) silt loam (about 18 percent clay); few fine distinct yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; friable; few fine roots; few secondary carbonates; moderate effervescence; mildly alkaline; clear wavy boundary.
Bw2—8 to 15 inches; grayish brown (2.5Y 5/2) silt loam (about 17 percent clay); common fine and medium

distinct yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; friable; few fine roots; few secondary carbonates; moderate effervescence; mildly alkaline; clear wavy boundary.

Bw3—15 to 23 inches; mottled grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) silt loam (about 17 percent clay); few fine faint yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; few secondary carbonates; moderate effervescence; mildly alkaline; gradual wavy boundary.

C—23 to 60 inches; brown (10YR 5/3) silt loam (about 17 percent clay); common fine and medium distinct grayish brown (2.5Y 5/2) and few fine faint yellowish brown (10YR 5/6 and 5/4) mottles; massive; friable; few secondary carbonates; few reddish brown (5YR 4/4) pipestems; moderate effervescence; mildly alkaline.

The thickness of the surface layer ranges from 4 to 9 inches. The thickness of the solum ranges from 20 to 30 inches.

The A horizon has value of 2 to 5 and chroma of 2 or 3. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6.

Muscatine Series

The Muscatine series consists of somewhat poorly drained, moderately permeable soils on nearly level ridgetops in the uplands and on loess-covered stream benches. These soils formed in loess. The native vegetation is tall prairie grasses. Slopes range from 0 to 5 percent.

Typical pedon of Muscatine silty clay loam, 0 to 2 percent slopes, in an area of cropland; 515 feet north and 100 feet west of the southeast corner of sec. 11, T. 78 N., R. 2 E.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam (about 28 percent clay), very dark grayish brown (10YR 3/2) dry; weak very fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A—10 to 15 inches; very dark brown (10YR 2/2) silty clay loam (30 percent clay), very dark grayish brown (10YR 3/2) dry; moderate fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

BA—15 to 21 inches; dark grayish brown (10YR 4/2) silty clay loam (33 percent clay); few fine distinct yellowish brown (10YR 5/4) mottles; moderate very fine subangular blocky structure; friable; common faint light gray (10YR 7/2 dry) silt coatings on faces of peds; common fine roots; few fine dark concretions of iron and manganese oxide; very dark brown (10YR 2/2) coatings on faces of peds; slightly acid; clear wavy boundary.

Bg1—21 to 30 inches; grayish brown (2.5Y 5/2) silty clay loam (about 35 percent clay); common fine prominent yellowish brown (10YR 5/6 and 5/8) mottles; moderate fine subangular blocky structure; friable; few fine roots; common faint light gray (10YR 7/2 dry) silt coatings on faces of peds; common fine dark concretions of iron and manganese oxide; very dark brown (10YR 4/2) coatings on faces of peds; moderately acid; gradual wavy boundary.

Bg2—30 to 39 inches; grayish brown (2.5Y 5/2) silty clay loam (32 percent clay); common fine and medium prominent yellowish brown (10YR 5/6 and 5/8) mottles; moderate fine and medium subangular blocky structure; friable; few fine roots; common faint light gray (10YR 7/2 dry) silt coatings on faces of peds; common fine dark concretions of iron and manganese; dark grayish brown (2.5Y 4/2) coatings on faces of peds; slightly acid; gradual wavy boundary.

Bg3—39 to 47 inches; grayish brown (2.5Y 5/2) silty clay loam (30 percent clay); many fine and medium prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; common fine and medium dark concretions of iron and manganese; slightly acid; gradual wavy boundary.

BCg—47 to 54 inches; grayish brown (2.5Y 5/2) silty clay loam (27 percent clay); many fine and medium prominent yellowish brown (10YR 5/6 and 5/8) and few fine prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; friable; common fine dark concretions of iron and manganese; neutral; gradual wavy boundary.

Cg—54 to 60 inches; grayish brown (2.5Y 5/2) silt loam (25 percent clay); many fine and medium prominent yellowish brown (10YR 5/6 and 5/8) and few fine prominent strong brown (7.5YR 5/6) mottles; massive; friable; common fine dark concretions of iron and manganese; neutral.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The Bg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It contains 30 to 35 percent clay. The C horizon has value of 5 or 6.

Niota Series

The Niota series consists of poorly drained, very slowly permeable soils in nearly level or slightly depressional areas on stream terraces and concave foot slopes. These soils formed in silty and clayey alluvial sediments. The native vegetation is mixed prairie grasses and deciduous trees. Slopes range from 0 to 5 percent.

The Niota soils in Scott County are taxadjuncts to the Niota series because they contain more clay than is defined for the series.

Typical pedon of Niota silt loam, 0 to 2 percent slopes, in an area of cropland; 1,720 feet east and 200 feet south of the northwest corner of sec. 19, T. 80 N., R. 5 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam (26 percent clay), grayish brown (10YR 5/2) dry; weak fine granular structure; few dark concretions of iron and manganese oxide; friable; neutral; abrupt smooth boundary.

E1—8 to 13 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine distinct yellowish brown (10YR 5/4) mottles; weak thin platy structure; friable; few fine dark concretions of iron and manganese oxide; moderately acid; clear wavy boundary.

E2—13 to 16 inches; dark grayish brown (10YR 4/2) silty clay loam (36 percent clay); few fine distinct yellowish brown (10YR 5/6) mottles; weak thin platy structure parting to moderate fine angular blocky; friable; many prominent light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; moderately acid; clear wavy boundary.

Btg1—16 to 22 inches; dark gray (10YR 4/1) clay (64 percent clay); very dark gray (10YR 3/1) coatings on faces of peds; common fine prominent yellowish brown (10YR 5/6 and 5/8) and few fine prominent dark brown (7.5YR 3/4) mottles; moderate fine angular blocky structure; firm; many fine distinct dark grayish brown (10YR 4/2) clay films on faces of peds; strongly acid; clear wavy boundary.

Btg2—22 to 30 inches; grayish brown (2.5Y 5/2) clay (72 percent clay); few fine prominent yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate fine angular blocky; firm; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds; moderately acid; clear wavy boundary.

Btg3—30 to 38 inches; grayish brown (2.5Y 5/2) clay (61 percent clay); few prominent yellowish brown (10YR 5/4) mottles; moderate coarse prismatic structure; firm; many fine distinct dark grayish brown (10YR 4/2) clay films; moderately acid; clear wavy boundary.

Btg4—38 to 49 inches; mottled grayish brown (2.5Y 5/2) and brown (10YR 5/3) clay (74 percent clay); few fine prominent yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure; firm; many fine distinct dark grayish brown (10YR 4/2) clay films on faces of peds; moderately acid; clear wavy boundary.

Btg5—49 to 60 inches; grayish brown (2.5Y 5/2) clay (69 percent clay); few fine distinct brown (10YR 5/3) and few fine prominent yellowish brown (10YR 5/4) mottles; moderate coarse prismatic structure; firm; many fine distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine dark concretions of manganese oxide; neutral.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The E horizon ranges from 6 to 10 inches in thickness. The Btg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 3. The maximum content of clay in the Btg horizon ranges from 60 to 75 percent.

Nodaway Series

The Nodaway series consists of moderately well drained, moderately permeable soils on flood plains. These soils formed in alluvium. The native vegetation is tall prairie grasses. Slopes range from 0 to 5 percent.

Typical pedon of Nodaway silt loam, 0 to 2 percent slopes, in an area of cropland; 1,120 feet south and 220 feet east of the northwest corner of sec. 5, T. 80 N., R. 1 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam (about 22 percent clay), grayish brown (10YR 5/2) dry; some very dark grayish brown (10YR 4/2) soil material; weak very fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

C—10 to 60 inches; stratified very dark grayish brown (10YR 3/2), dark brown (10YR 3/3), dark grayish brown (10YR 4/2), and brown (10YR 4/3) silt loam (about 20 percent clay); massive with horizontal cleavage planes because of stratification; friable; common fine roots; few fine dark oxides; neutral.

The A or Ap horizon is 6 to 10 inches thick. It has value of 2 or 3 and chroma of 1 or 2. The C horizon has value of 3 to 6 and chroma of 1 to 4. It is dominantly silt loam but has thin strata of silty clay loam, fine sandy loam, or loam. The sand is fine or very fine.

Nordness Series

The Nordness series consists of well drained, moderately permeable soils on side slopes and escarpments in the uplands. These soils formed in silty and loamy material over limestone bedrock. The native vegetation is deciduous trees. Slopes range from 18 to 40 percent.

Typical pedon of Nordness silt loam, 18 to 40 percent slopes, in an area of timber; 1,025 feet east and 1,110 feet north of the southwest corner of sec. 27, T. 80 N., R. 5 E.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam (about 22 percent clay), grayish brown (10YR 5/2) dry; weak very fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

E—4 to 6 inches; brown (10YR 4/3 and 5/3) silt loam (about 20 percent clay), light brownish gray (10YR 6/2) dry; dark brown (10YR 3/3) coatings on faces of peds; weak very thin platy structure; friable; common fine roots; neutral; gradual wavy boundary.

Bt1—6 to 12 inches; brown (10YR 5/3) silty clay loam (about 30 percent clay); moderate fine subangular blocky structure; friable; common fine roots; few faint clay films on faces of peds; neutral; gradual wavy boundary.

Bt2—12 to 14 inches; brown (10YR 5/3) clay loam (about 34 percent clay); moderate fine subangular blocky structure; friable; few faint clay films on faces of peds; few 2- to 4-mm fragments of limestone; neutral; abrupt smooth boundary.

R—14 inches; hard, fractured limestone bedrock.

The thickness of the solum ranges from 8 to 20 inches. The A horizon ranges from 1 to 5 inches in thickness. It has value of 3 or 4 and chroma of 1 or 2. It generally is silt loam, but the range includes loam. The Bt horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 3 to 6. It is loam, clay loam, or silty clay loam.

Olmitz Series

The Olmitz series consists of moderately well drained, moderately permeable soils on alluvial fans and foot slopes. These soils formed in local alluvium derived from glacial till. The native vegetation is tall prairie grasses. Slopes range from 3 to 9 percent.

Typical pedon of Olmitz loam, 3 to 9 percent slopes, in an area of cropland; 140 feet south and 1,160 feet west of the center of sec. 5, T. 77 N., R. 3 E.

Ap—0 to 9 inches; black (10YR 2/1) loam (about 25 percent clay), dark gray (10YR 4/1) dry; moderate very fine granular structure; friable; many fine roots; neutral; clear smooth boundary.

A1—9 to 15 inches; very dark brown (10YR 2/2) loam (about 25 percent clay), dark grayish brown (10YR 4/2) dry; many faint black (10YR 2/1) coatings on faces of peds; moderate fine granular structure; friable; many fine roots; neutral; clear wavy boundary.

A2—15 to 22 inches; very dark grayish brown (10YR 3/2) loam (about 25 percent clay), grayish brown (10YR 5/2) dry; few faint very dark brown (10YR 2/2) coatings on faces of peds; moderate very fine subangular blocky structure; friable; common fine roots; slightly acid; gradual wavy boundary.

A3—22 to 30 inches; dark brown (10YR 3/3) loam (about 25 percent clay), brown (10YR 5/3) dry; few faint very dark brown (10YR 2/2) coatings on faces of peds; moderate very fine and fine subangular blocky structure; friable; common fine roots; slightly acid; gradual wavy boundary.

Bw1—30 to 38 inches; dark brown (10YR 3/3) clay loam (about 28 percent clay); few faint very dark grayish brown (10YR 3/2) coatings on faces of peds; moderate fine subangular blocky structure; friable; common fine roots; slightly acid; gradual wavy boundary.

Bw2—38 to 51 inches; brown (10YR 4/3) clay loam (about 29 percent clay); few faint dark brown (10YR 3/3) coatings on faces of peds; moderate fine and medium subangular blocky structure; friable; few fine roots; slightly acid; gradual wavy boundary.

Bw3—51 to 60 inches; dark yellowish brown (10YR 4/4) clay loam (about 30 percent clay); few fine dark brown (10YR 3/3) coatings on faces of peds; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; slightly acid.

The thickness of the solum ranges from 50 to more than 60 inches. The thickness of the mollic epipedon ranges from 24 to 40 inches.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The Bw horizon has value of 3 or 4 and chroma of 2 to 4.

Perks Series

The Perks series consists of excessively drained, moderately rapidly permeable soils on flood plains. These soils formed in sandy alluvium. The native vegetation is deciduous trees. Slopes range from 0 to 5 percent.

Typical pedon of Perks sand, 0 to 3 percent slopes, in an area of woodland; 1,600 feet east and 2,200 feet

north of the southwest corner of sec. 12, T. 80 N., R. 2 E.

A—0 to 4 inches; dark brown (10YR 3/3) sand (about 13 percent clay), brown (10YR 5/3) dry; weak fine granular structure; very friable; common fine roots; slightly acid; clear smooth boundary.
C1—4 to 16 inches; dark yellowish brown (10YR 4/4) sand (about 6 percent clay); single grain; very friable and loose; common fine roots; slightly acid; clear wavy boundary.
C2—16 to 35 inches; dark yellowish brown (10YR 4/4) sand (about 4 percent clay); single grain; loose; few fine roots; slightly acid; gradual wavy boundary.
C3—35 to 48 inches; yellowish brown (10YR 5/4) sand (about 4 percent clay); single grain; loose; slightly acid; gradual wavy boundary.
C4—48 to 60 inches; yellowish brown (10YR 5/6) sand (about 4 percent clay); single grain; loose; slightly acid.

The thickness of the solum is less than 10 inches. It corresponds to the thickness of the A or Ap horizon.

The A or Ap horizon has value of 3 and chroma of 2 or 3. It is sandy loam, loamy sand, or sand. The C horizon has value and chroma of 4 to 6.

Pillot Series

The Pillot series consists of well drained soils on uplands. These soils formed in silty and sandy sediments. Permeability is moderate in the upper part of the solum and rapid in the lower part. The native vegetation is prairie grasses. Slopes range from 2 to 9 percent.

Typical pedon of Pillot silt loam, 2 to 5 percent slopes, in an area of cropland; 1,200 feet east and 325 feet north of the southwest corner of sec. 12, T. 79 N., R. 3 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam (about 22 percent clay), dark grayish brown (10YR 4/2) dry; some very dark brown (10YR 2/2) soil material; weak fine granular structure; friable; slightly acid; common fine roots; abrupt smooth boundary.
A—7 to 15 inches; dark brown (10YR 3/3) silt loam (about 22 percent clay), brown (10YR 4/3) dry; weak fine granular structure; friable; common fine roots; slightly acid; clear wavy boundary.
BA—15 to 24 inches; dark yellowish brown (10YR 4/4) silt loam (about 24 percent clay); dark brown (10YR 3/3) coatings on faces of peds; few fine faint brown (10YR 5/3) mottles; moderate very fine subangular blocky structure; friable; few fine roots; moderately acid; clear wavy boundary.
Bt1—24 to 30 inches; dark yellowish brown (10YR 4/4) silty clay loam (about 29 percent clay); moderate fine subangular blocky structure; friable; few fine faint brown (10YR 4/3) clay films on faces of peds; few dark concretions of iron and manganese oxide; few fine distinct very dark brown (10YR 2/2) stains on faces of some peds; moderately acid; clear wavy boundary.
Bt2—30 to 34 inches; mottled brown (10YR 4/3) and yellowish brown (10YR 5/4) silty clay loam (about 30 percent clay); common fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; few dark concretions of iron and manganese oxide; moderately acid; abrupt smooth boundary.
2BC—34 to 40 inches; brown (10YR 5/3) loamy sand (about 6 percent clay); weak medium prismatic structure; few ¼-inch-thick lamellae of strong brown (7.5YR 5/6) sandy loam at a depth of 38 inches; moderately acid; clear wavy boundary.
2C—40 to 60 inches; pale brown (10YR 6/3) sand (about 4 percent clay); single grain; moderately acid.

The thickness of the solum ranges from 30 to 45 inches. The thickness of the A horizon ranges from 10 to 18 inches.

The A horizon has value and chroma of 2 or 3. The B horizon has value of 3 to 5 and chroma of 3 or 4.

The Pillot soil in detailed soil map unit 450C2 is a taxadjunct to the Pillot series because its dark surface layer is not thick enough to qualify as a mollic epipedon.

Richwood Series

The Richwood series consists of well drained, moderately permeable soils on stream terraces along the major streams. These soils formed in silty alluvium. The native vegetation is tall prairie grasses. Slopes range from 0 to 5 percent.

Typical pedon of Richwood silt loam, 0 to 2 percent slopes, in a cultivated field on a level terrace along a stream; 1,440 feet north and 800 feet west of the southeast corner of sec. 2, T. 79 N., R. 1 E.

Ap—0 to 9 inches; very dark brown (10YR 2/2) silt loam (about 20 percent clay), dark grayish brown (10YR 4/2) dry; weak very fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.
A1—9 to 18 inches; very dark grayish brown (10YR 3/2) silt loam (about 20 percent clay), dark grayish

brown (10YR 4/2) dry; very dark brown (10YR 2/2) coatings on faces of peds; weak fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

A2—18 to 23 inches; dark brown (10YR 3/3) silt loam (about 20 percent clay), brown (10YR 5/3) dry; very dark grayish brown (10YR 3/2) coatings on faces of peds; weak fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

Bt1—23 to 31 inches; dark yellowish brown (10YR 4/4) silt loam (about 24 percent clay); few fine faint brown (10YR 5/3) and few fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak fine subangular blocky structure; friable; common fine roots; common faint clay films on faces of peds; neutral; gradual wavy boundary.

Bt2—31 to 38 inches; dark yellowish brown (10YR 4/3) silty clay loam (about 28 percent clay); few fine faint yellowish brown (10YR 5/4) mottles; moderate fine and medium subangular blocky structure; friable; few fine roots; common faint clay films on faces of peds; few fine dark concretions of iron and manganese oxide; neutral; gradual wavy boundary.

Bt3—38 to 44 inches; dark yellowish brown (10YR 4/4) silty clay loam (about 29 percent clay); few fine faint yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; friable; few fine roots; common faint clay films on faces of peds; few fine dark concretions of manganese oxide; neutral; gradual wavy boundary.

BC—44 to 58 inches; dark yellowish brown (10YR 4/4) silty clay loam (about 28 percent clay); few fine distinct dark yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine dark concretions of manganese oxide; neutral; gradual wavy boundary.

2C—58 to 65 inches; brown (10YR 5/3) fine sand; single grain; loose; neutral.

The thickness of the solum ranges from 50 to more than 60 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The Bt horizon has value of 4 or 5 and chroma of 3 or 4. The content of clay in the Bt horizon ranges from 20 to 30 percent. The 2C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is fine sand or sand.

Rockton Series

The Rockton series consists of well drained, moderately permeable soils in benchlike areas. These soils formed in 20 to 40 inches of loamy material over limestone bedrock. The native vegetation is tall prairie grasses. Slopes range from 0 to 3 percent.

Typical pedon of Rockton loam, 0 to 3 percent slopes, in a cultivated field; 875 feet south and 1,750 feet west of the center of sec. 21, T. 77 N., R. 2 E.

Ap—0 to 10 inches; black (10YR 2/1) loam (about 22 percent clay), dark gray (10YR 4/1) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

A1—10 to 16 inches; very dark brown (10YR 2/2) loam (about 22 percent clay), dark grayish brown (10YR 4/2) dry; moderate fine granular structure; friable; slightly acid; gradual smooth boundary.

A2—16 to 21 inches; dark brown (10YR 3/3) loam (about 24 percent clay), brown (10YR 5/3) dry; moderate fine granular structure; friable; mildly alkaline; gradual wavy boundary.

Bt—21 to 34 inches; brown (10YR 4/3) sandy clay loam (about 30 percent clay); moderate fine subangular blocky structure; friable; few faint clay films on faces of peds; mildly alkaline; gradual wavy boundary.

R—34 inches; fractured limestone bedrock.

The thickness of the solum and the depth to limestone bedrock range from 20 to 40 inches. The thickness of the mollic epipedon ranges from 16 to 22 inches.

The A horizon has value of 2 or 3 and chroma of 1 to 3. It is loam or silt loam. The Bt horizon is loam, sandy clay loam, or clay loam.

Rowley Series

The Rowley series consists of somewhat poorly drained, moderately permeable soils on stream terraces. These soils formed in silty alluvial sediments. The native vegetation is tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Rowley silt loam, 0 to 2 percent slopes, in an area of cropland; 1,450 feet south and 120 feet west of the northeast corner of sec. 2, T. 79 N., R. 1 E.

Ap—0 to 8 inches; black (10YR 2/1) silt loam (about 20 percent clay), dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; many fine roots; neutral; abrupt smooth boundary.

A1—8 to 13 inches; black (10YR 2/1) silt loam (about 20 percent clay), dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; common fine roots; neutral; gradual smooth boundary.

A2—13 to 18 inches; very dark grayish brown (10YR 3/2) silt loam (about 20 percent clay), grayish brown

(10YR 5/2) dry; weak fine subangular blocky structure; friable; common fine roots; neutral; gradual smooth boundary.

AB—18 to 23 inches; very dark grayish brown (10YR 3/2) silt loam (about 22 percent clay), grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; many fine roots; few fine dark oxides; neutral; clear wavy boundary.

Btg1—23 to 30 inches; grayish brown (10YR 5/2) silt loam (about 26 percent clay); few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; common fine roots; few faint clay films; few fine dark concretions of manganese oxide; neutral; gradual wavy boundary.

Btg2—30 to 44 inches; light brownish gray (2.5Y 6/2) silt loam (about 26 percent clay); grayish brown (10YR 5/2) coatings on faces of peds; common fine prominent yellowish brown (10YR 5/6 and 5/8) mottles; moderate fine and medium subangular blocky structure; friable; common fine roots; few faint clay films; few fine dark concretions of manganese oxide; neutral; gradual wavy boundary.

BCg—44 to 57 inches; light brownish gray (2.5Y 6/2) silt loam (about 22 percent clay); few fine prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak medium prismatic structure; friable; few fine roots; few fine dark concretions of manganese oxide; neutral; gradual wavy boundary.

2C—57 to 64 inches; brown (10YR 5/3) fine sand; single grain; loose; neutral.

The thickness of the solum ranges from 40 to more than 60 inches. The thickness of the mollic epipedon ranges from 10 to 24 inches.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The Btg horizon has value of 4 or 5 and chroma of 1 to 3. The content of clay in the Btg horizon ranges from 20 to 30 percent. The 2C horizon has value of 4 to 6 and chroma of 2 to 6. It is sand or fine sand.

Shaffton Series

The Shaffton series consists of somewhat poorly drained soils on flood plains. Permeability is moderate in the upper part of the profile and very rapid in the lower part. These soils formed in loamy alluvial sediments. The native vegetation is tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Shaffton loam, 0 to 2 percent slopes, in an area of cropland; 775 feet north and 315 feet east of the center of sec. 23, T. 80 N., R. 5 E.

Ap—0 to 9 inches; black (10YR 2/1) loam (about 24 percent clay), dark grayish brown (10YR 4/2) dry; moderate very fine granular structure; friable; neutral; abrupt smooth boundary.

A—9 to 22 inches; very dark grayish brown (10YR 3/2) loam (about 24 percent clay), very dark grayish brown (10YR 4/2) dry; moderate very fine granular structure; friable; slightly acid; abrupt smooth boundary.

Bw1—22 to 36 inches; brown (10YR 4/3) loam (about 20 percent clay); few fine faint dark grayish brown (10YR 4/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; moderately acid; clear wavy boundary.

Bw2—36 to 42 inches; brown (10YR 4/3) loam (about 22 percent clay); few fine faint dark grayish brown (10YR 4/2) mottles; moderate medium subangular blocky structure; very friable; moderately acid; clear smooth boundary.

C1—42 to 55 inches; brown (10YR 4/3) loam (about 26 percent clay); few fine faint dark grayish brown (10YR 4/2) and few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; slightly acid; clear wavy boundary.

C2—55 to 60 inches; grayish brown (10YR 5/2) sand; few fine and medium distinct yellowish brown (10YR 5/6) mottles; single grain; loose; slightly acid.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The upper part of the A horizon generally is loam. The lower part is loam or sandy loam. The upper part of the Bw horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. The C horizon ranges from silt loam to sand. It is stratified in some pedons.

Shelby Series

The Shelby series consists of well drained, moderately slowly permeable soils on convex side slopes in the uplands. These soils formed in glacial till. The native vegetation is tall prairie grasses. Slopes range from 9 to 18 percent.

The Shelby soils in Scott County are taxadjuncts to the Shelby series because they do not have a mollic epipedon.

Typical pedon of Shelby clay loam, 14 to 18 percent slopes, severely eroded, in a pastured area; 625 feet east and 1,180 feet north of the southwest corner of sec. 11, T. 78 N., R. 2 E.

Ap—0 to 6 inches; dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) clay loam (about 28 percent clay), brown (10YR 5/3) dry; streaks and pockets of dark brown (10YR 3/3) soil material from the original surface layer; weak very fine granular

structure; friable; many fine and common medium roots; neutral; abrupt smooth boundary.

Bt1—6 to 11 inches; yellowish brown (10YR 5/4) clay loam (about 32 percent clay); dark yellowish brown (10YR 4/4) coatings on faces of peds; weak very fine and fine subangular blocky structure; friable; many fine roots; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; about 2 percent fine pebbles; slightly acid; clear smooth boundary.

Bt2—11 to 15 inches; yellowish brown (10YR 5/4) clay loam (about 34 percent clay); few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; many fine roots; many faint brown (10YR 5/3) clay films on faces of peds; about 5 percent fine pebbles; slightly acid; clear smooth boundary.

Bt3—15 to 24 inches; yellowish brown (10YR 5/4) clay loam (about 34 percent clay); common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; common fine roots; many faint clay films; few faint pale brown (10YR 6/3 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; about 5 percent fine pebbles; moderately acid; clear wavy boundary.

Bt4—24 to 32 inches; yellowish brown (10YR 5/4) clay loam (about 32 percent clay); common fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium and coarse subangular blocky structure; firm; few fine roots; many faint clay films on faces of peds; few fine dark concretions of iron and manganese oxide; about 5 percent fine pebbles; moderately acid; gradual wavy boundary.

Bt5—32 to 38 inches; yellowish brown (10YR 5/4) clay loam (about 32 percent clay); few fine distinct grayish brown (10YR 5/2) and few fine prominent strong brown (7.5YR 5/6) mottles; medium coarse subangular blocky structure; firm; few fine roots; few faint clay films on faces of peds; few fine dark concretions of iron and manganese oxide; about 5 percent fine pebbles; slightly acid; gradual wavy boundary.

BC—38 to 47 inches; mottled yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) clay loam (about 32 percent clay); common fine distinct yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure; firm; common fine dark concretions of iron and manganese oxide; about 5 percent fine pebbles; neutral; gradual wavy boundary.

C—47 to 60 inches; mottled yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) clay loam (about 30 percent clay); common fine distinct yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 5/6) mottles; massive; firm; common fine dark concretions of iron and manganese oxide; about 5 percent fine pebbles; neutral.

The thickness of the solum ranges from 30 to 50 inches. The thickness of the A or Ap horizon ranges from 6 to 8 inches.

The Ap horizon generally has value of 3 or 4 and chroma of 2 or 3. In severely eroded areas, however, it has value of 4 or 5 and chroma of 4. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. The content of clay in the Bt horizon generally is 30 to 35 percent but ranges to 38 percent.

Sparta Series

The Sparta series consists of excessively drained, rapidly permeable soils on uplands and stream terraces. These soils formed in sandy windblown material and sandy alluvium that has been reworked by wind. The native vegetation is tall prairie grasses. Slopes range from 0 to 14 percent.

Typical pedon of Sparta loamy fine sand, 2 to 5 percent slopes, in an area of cropland; 1,900 feet east and 1,100 feet north of the center of sec. 22, T. 80 N., R. 5 E.

Ap—0 to 12 inches; very dark brown (10YR 2/2) loamy fine sand (about 6 percent clay), dark grayish brown (10YR 4/2) dry; very weak fine granular structure; very friable; many very fine roots; slightly acid; clear smooth boundary.

A—12 to 23 inches; very dark grayish brown (10YR 3/2) loamy fine sand (about 6 percent clay), grayish brown (10YR 5/2) dry; very weak fine subangular blocky structure; very friable; common very fine roots; slightly acid; gradual wavy boundary.

Bw—23 to 36 inches; very dark grayish brown (10YR 3/2) fine sand (about 5 percent clay); very weak fine subangular blocky structure; very friable; common very fine roots; moderately acid; gradual wavy boundary.

C1—36 to 50 inches; dark brown (10YR 4/3) fine sand (about 4 percent clay); single grain; loose; few fine roots; moderately acid; gradual wavy boundary.

C2—50 to 60 inches; dark yellowish brown (10YR 4/4) sand (about 4 percent clay); single grain; loose; moderately acid.

The thickness of the solum ranges from 24 to 40 inches. The thickness of the mollic epipedon ranges from 12 to 24 inches.

The A horizon has hue of 7.5YR or 10YR and

chroma of 1 or 2. It generally is loamy fine sand. The Bw horizon has hue of 7.5YR or 10YR and value and chroma of 2 to 6. It is fine sand, loamy fine sand, or sand. The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6.

Tama Series

The Tama series consists of well drained, moderately permeable soils on convex ridgetops and side slopes in the uplands and on stream benches. These soils formed in loess. The native vegetation is tall prairie grasses. Slopes range from 2 to 18 percent.

Typical pedon of Tama silty clay loam, 2 to 5 percent slopes, in an area of cropland; 175 feet east and 1,350 feet north of the southwest corner of sec. 11, T. 79 N., R. 2 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) silty clay loam (29 percent clay), dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

A1—8 to 14 inches; very dark brown (10YR 2/2) silty clay loam (28 percent clay), dark grayish brown (10YR 4/2) dry; black (10YR 2/1) organic coatings on faces of peds; moderate medium granular structure; friable; many fine roots; slightly acid; clear wavy boundary.

A2—14 to 19 inches; very dark grayish brown (10YR 3/2) silty clay loam (29 percent clay), brown (10YR 4/3) dry; very dark grayish brown (10YR 3/2) organic coatings on faces of peds; moderate medium granular structure; friable; common fine roots; slightly acid; clear wavy boundary.

BA—19 to 25 inches; brown (10YR 4/3) silty clay loam (33 percent clay); dark brown (10YR 3/3) organic coatings on faces of peds; moderate very fine subangular blocky structure; friable; common fine roots; few thin clay films; moderately acid; gradual wavy boundary.

Bt1—25 to 36 inches; brown (10YR 4/3) silty clay loam (35 percent clay); few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; few fine roots; many faint clay films on faces of peds; few faint pale brown (10YR 6/3 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; moderately acid; gradual wavy boundary.

Bt2—36 to 44 inches; yellowish brown (10YR 5/4) silty clay loam (33 percent clay); few fine faint dark grayish brown (10YR 4/2) and common fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; friable; few fine roots; many faint clay films on vertical faces of peds; common faint pale brown (10YR 6/3 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; moderately acid; gradual wavy boundary.

BC—44 to 60 inches; yellowish brown (10YR 5/4) silty clay loam (28 percent clay); common fine distinct yellowish brown (10YR 5/6) and few distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure; friable; few faint pale brown (10YR 6/3 dry) silt coatings on faces of peds; common fine dark concretions of iron and manganese oxide; moderately acid.

The thickness of the solum ranges from 36 to more than 60 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The Bt horizon has value of 4 or 5 and chroma of 3 or 4. It contains 27 to 35 percent clay. The C horizon, if it occurs, has colors similar to those of the Bt horizon.

The Tama soils in detailed soil map units 120C3, 120D3, and 120E3 are taxadjuncts to the Tama series because their surface layer is not dark enough to qualify as a mollic epipedon. The Tama soils in detailed soil map units 120B2, 120C2, 120D2, 120E2, 442C2, 442D2, 442E2, 920C2, and 920D2 are taxadjuncts to the Tama series because their dark surface layer is not thick enough to qualify as a mollic epipedon.

Timula Series

The Timula series consists of well drained, moderately permeable soils on side slopes in the uplands. These soils formed in loess. The native vegetation is deciduous trees. Slopes range from 9 to 25 percent.

Typical pedon of Timula silt loam, 14 to 18 percent slopes, severely eroded, in an area of cropland; 1,550 feet west and 150 feet south of the northeast corner of sec. 11, T. 79 N., R. 4 W.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam (about 26 percent clay), pale brown (10YR 6/3) dry; streaks and pockets of dark brown (10YR 3/3) material from the original surface layer; weak very fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Bw1—6 to 10 inches; brown (10YR 4/3) silt loam (about 26 percent clay); few fine faint grayish brown (10YR 5/2) and few fine faint yellowish brown (10YR 5/4) mottles; weak medium granular structure; common fine roots; few fine dark concretions of iron and manganese oxide; neutral; clear smooth boundary.

Bw2—10 to 17 inches; mixed brown (10YR 5/3) and yellowish brown (10YR 5/4) silt loam (about 25

percent clay); common fine distinct yellowish brown (10YR 5/6) and few fine faint grayish brown (10YR 5/2) mottles; weak medium granular structure; friable; common fine roots; few fine dark concretions of iron and manganese oxide; neutral; clear wavy boundary.

Bw3—17 to 26 inches; grayish brown (10YR 5/2) silt loam (about 24 percent clay); few fine prominent strong brown (7.5YR 5/8) mottles; moderate fine and medium subangular blocky structure; friable; few fine roots; neutral; clear wavy boundary.

Bw4—26 to 34 inches; grayish brown (2.5Y 5/2) silt loam (about 20 percent clay); few medium and coarse prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure; friable; mildly alkaline; clear wavy boundary.

C1—34 to 48 inches; grayish brown (2.5Y 5/2) silt loam (about 17 percent clay); few fine and medium prominent strong brown (7.5YR 5/6) mottles; massive; friable; few fine dark concretions of iron and manganese oxide; few reddish brown (5YR 4/4) pipestems; slight effervescence in lower part; moderately alkaline; abrupt wavy boundary.

C2—48 to 60 inches; grayish brown (2.5Y 5/2) silt loam (about 15 percent clay); few fine and medium prominent strong brown (7.5YR 5/6) mottles; massive; friable; few fine dark concretions of iron and manganese oxide; few reddish brown (5YR 4/4) pipestems; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 18 to 36 inches. The depth to carbonates ranges from 20 to 35 inches.

The Ap horizon has value of 3 or 4 and chroma of 2 to 4. The B and C horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4.

Walford Series

The Walford series consists of poorly drained and very poorly drained, moderately slowly permeable soils on flats or in depressions in the uplands and in benchlike areas. These soils formed in loess. The native vegetation is mixed prairie grasses and trees. Slopes range from 0 to 2 percent.

Typical pedon of Walford silt loam, 0 to 2 percent slopes, in an area of cropland; 750 feet east and 600 feet south of the northwest corner of sec. 28, T. 79 N., R. 2 E.

Ap—0 to 9 inches; very dark brown (10YR 2/2) silt loam (about 24 percent clay), grayish brown (10YR 5/2) dry; weak fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

E—9 to 13 inches; dark grayish brown (10YR 4/2) silt loam (about 22 percent clay); common fine distinct yellowish brown (10YR 5/6) mottles; moderate thin platy structure; friable; common fine roots; few fine dark concretions of iron and manganese oxide; moderately acid; clear smooth boundary.

Btg1—13 to 19 inches; grayish brown (2.5Y 5/2) silty clay loam (about 29 percent clay); common fine prominent yellowish brown (10YR 5/4) mottles; moderate very fine and fine subangular blocky structure; friable; common fine roots; few fine faint clay films; common fine distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; strongly acid; clear wavy boundary.

Btg2—19 to 26 inches; grayish brown (2.5Y 5/2) silty clay loam (about 34 percent clay); common fine prominent yellowish brown (10YR 5/6) mottles; moderate very fine and fine angular and subangular blocky structure; friable; common fine roots; few distinct clay films; few fine distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; moderately acid; clear wavy boundary.

Btg3—26 to 32 inches; light brownish gray (2.5Y 6/2) silty clay loam (about 34 percent clay); common fine prominent yellowish brown (10YR 5/6) mottles; moderate fine angular and subangular blocky structure; friable; common fine roots; many fine distinct clay films; few fine distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; slightly acid; clear wavy boundary.

Btg4—32 to 40 inches; light brownish gray (2.5Y 6/2) silty clay loam (about 32 percent clay); common fine prominent yellowish brown (10YR 5/4 and 5/6) and common fine faint dark gray (10YR 4/1) mottles; moderate fine angular and subangular blocky structure; friable; few fine roots; many fine distinct clay films; common fine dark concretions of iron and manganese oxide; moderately acid; gradual wavy boundary.

Btg5—40 to 49 inches; light brownish gray (2.5Y 6/2) silty clay loam (about 30 percent clay); few fine prominent yellowish brown (10YR 5/4 and 5/6) and few fine distinct dark gray (10YR 4/1) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; friable; few fine roots; few fine distinct clay films on vertical faces of peds; few fine dark concretions of iron and manganese oxide; moderately acid; gradual wavy boundary.

BCg—49 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam (about 30 percent clay); common fine

prominent yellowish brown (10YR 5/4 and 5/6) and few fine distinct dark gray (10YR 4/1) mottles; weak medium prismatic structure; friable; common fine dark concretions of iron and manganese oxide; slightly acid.

The Ap or A horizon has value of 2 or 3 and chroma of 1 or 2. The E horizon has value of 4 to 6 and chroma of 1 or 2. The Btg horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 or 2. The content of clay in the Btg horizon generally is 27 to 35 percent, but in some thin subhorizons it ranges to as much as 37 percent. The Cg horizon, if it occurs, has hue of 2.5Y or 5Y, value of 5 or 6, and chroma of 1 or 2.

Whittier Series

The Whittier series consists of well drained soils on uplands. These soils formed in loess or silty sediments and the underlying sandy sediments. Permeability is moderate in the upper part and rapid in the lower part. The native vegetation is mixed grasses and trees. Slopes range from 2 to 9 percent.

Typical pedon of Whittier silt loam, 5 to 9 percent slopes, moderately eroded, in an area of cropland; 200 feet west and 700 feet north of the center of sec. 20, T. 80 N., R. 4 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam (about 22 percent clay), grayish brown (10YR 5/2) dry; streaks and pockets of brown (10YR 4/3) subsoil material; weak very fine granular structure; friable; neutral; abrupt smooth boundary.

Bt1—8 to 13 inches; dark yellowish brown (10YR 4/3) silty clay loam (about 28 percent clay); moderate very fine subangular blocky structure; friable; many fine roots; few medium faint light gray (10YR 7/2 dry) silt coatings on peds; few fine faint clay films on faces of peds; few dark concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt2—13 to 22 inches; dark yellowish brown (10YR 4/4) silty clay loam (about 30 percent clay); moderate very fine and fine subangular blocky and angular blocky structure; friable; many fine roots; many fine faint clay films on faces of peds; common fine faint light gray (10YR 7/2 dry) silt coatings on peds; few dark concretions of iron and manganese oxide; slightly acid; clear wavy boundary.

Bt3—22 to 32 inches; dark yellowish brown (10YR 4/4) silty clay loam (about 28 percent clay); few fine distinct yellowish brown (10YR 5/6) and few fine faint brown (10YR 5/3) mottles; moderate fine and medium subangular blocky and angular blocky structure; friable; common fine roots; common fine faint brown (10YR 4/3) clay films on faces of peds; few dark concretions of iron and manganese oxide; moderately acid; clear wavy boundary.

2BC—32 to 36 inches; yellowish brown (10YR 5/4) sandy loam (about 14 percent clay); dark yellowish brown (10YR 4/4) coatings on faces of peds; weak medium subangular blocky structure; very friable; few fine faint clay films on faces of peds; some clay bridges between sand grains; slightly acid; abrupt wavy boundary.

2C1—36 to 48 inches; yellowish brown (10YR 5/6) fine sand (about 5 percent clay); single grain; loose; slightly acid; gradual wavy boundary.

2C2—48 to 60 inches; yellowish brown (10YR 5/4) fine sand; single grain; loose; slightly acid.

The thickness of the solum ranges from 30 to 48 inches. The thickness of the A horizon ranges from 6 to 9 inches. The depth to loamy sand or sand ranges from 24 to 40 inches.

The A horizon has chroma of 1 or 2. The E horizon, if it occurs, has value of 4 and chroma of 2 or 3. The 2C horizon is loamy sand or sand.

Zook Series

The Zook series consists of poorly drained, slowly permeable soils on flood plains. These soils formed in silty and clayey alluvium in slack-water areas. The native vegetation is tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Zook silty clay loam, 0 to 2 percent slopes, in an area of cropland; 1,200 feet east and 1,540 feet south of the northwest corner of sec. 8, T. 77 N., R. 3 E.

Ap—0 to 8 inches; black (N 2/0) silty clay loam (about 38 percent clay), dark gray (10YR 4/1) dry; weak very fine granular structure; firm; common fine roots; neutral; abrupt smooth boundary.

A1—8 to 16 inches; black (N 2/0) silty clay (about 41 percent clay), dark gray (10YR 4/1) dry; moderate very fine granular blocky structure; firm; common fine roots; neutral; gradual smooth boundary.

A2—16 to 24 inches; black (10YR 2/1) silty clay (about 43 percent clay), dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; firm; few fine roots; neutral; gradual wavy boundary.

A3—24 to 33 inches; very dark gray (10YR 3/1) silty clay (about 44 percent clay), gray (10YR 5/1) dry; moderate fine subangular blocky structure; firm; few fine roots; slightly acid; gradual wavy boundary.

Bg—33 to 45 inches; very dark gray (10YR 3/1) silty

clay (about 42 percent clay); few fine prominent strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; slightly acid; gradual wavy boundary.

Cg—45 to 60 inches; dark gray (10YR 4/1) silty clay (about 42 percent clay); common coarse prominent strong brown (7.5YR 5/6) mottles; massive; firm; slightly acid.

The thickness of the solum ranges from 36 to more than 50 inches. The thickness of the mollic epipedon ranges from 24 to 50 inches.

The A horizon has value of 2 or 3 and chroma of 0 or 1. It is silty clay loam or silty clay. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 5, and chroma of 1 or 2. It is silty clay or silty clay loam. It contains 36 to 44 percent clay. In some pedons loamy sand or sand is below a depth of 40 inches.

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Formation of the Soils

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by five soil-forming factors: 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, or lay of the land; and the length of time that the forces of soil formation have acted on soil material *(3)*. Human activities also affect soil formation.

Climate and plant and animal life are active factors in 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 profile that is formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of parent material into a soil. A long period of time generally is needed for the development of distinct horizons. The factors of soil development are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one unless conditions are specified for the others.

Parent Material

The accumulation of parent material is the first step in the formation of a soil. Some of the soils in the county formed in material that remained in place after it weathered from bedrock. Most of the soils, however, formed in material that was transported from other locations and redeposited through the action of glacial ice, water, wind, or gravity. The main kinds of parent material in the county are loess, glacial till, alluvium, and sandy eolian material. The less extensive kinds are organic deposits and residuum.

Loess is the most extensive parent material in the county. This silty windblown material, which was deposited during the Wisconsin age, mantles the glacial till. It generally is calcareous if it has not been weathered. The thickness of the loess varies. In some areas of the county, loess does not mantle the glacial till or only 20 to 40 inches of loess overlies the glacial till. Dinsdale and Klinger soils formed in 24 to 40 inches of loess and in the underlying glacial till. In the rest of the county, the loess is 6 to 12 feet thick. Downs, Muscatine, and Tama soils are formed in 6 to 12 feet of loess. In some areas of the county, the loess has strata of sand, loamy sand, or sandy loam.

Glacial drift is all rock material transported or deposited by glacial ice, including glacial till and the material sorted by meltwater. Glacial till is unsorted sediment in which particles range in size from boulders to clay *(6)*. It is the second most extensive parent material in the county. At least twice during the glacial period, continental glaciers moved over the land. The record of these two ice invasions is contained in the unconsolidated rock material that was deposited by the melting ice and meltwater streams. The older ice sheet, known as the Nebraskan Glaciation, covered the area about 750,000 years ago *(4)*. It was followed by the Aftonian interglacial period. The Kansan Glaciation is thought to have started about 500,000 years ago. It was followed by the Yarmouth interglacial period. A third glaciation may have occurred after the Yarmouth interglacial period, about 150,000 years ago.

Some of the landscape in the county is a multilevel sequence of erosional surfaces. Many of these levels are cut into Kansan and Nebraskan till. The multilevel Iowan erosional surface is arranged in a series of steps from the major drainageways toward the stream divides. It is marked by a stone line where it cuts through the Kansan and Nebraskan till. The stone line occurs on all levels of the stepped surfaces and under the alluvium along the drainageways.

Clyde and Kenyon soils formed in loamy surficial sediments and in the underlying glacial till on the Iowan erosional surface. Gara, Lindley, and Shelby soils formed in glacial till.

Alluvium is material deposited by water on flood plains and terraces along watercourses. It is of Late Wisconsin age in Scott County. It occurs as lenses and layers of sand, gravel, silt, and clay. This alluvial material varies in thickness. Along major streams it is very thick, but along the smaller streams it is less than 5 feet thick. Flagler and Lawler soils formed in loamy alluvium over sand and gravel, and Richwood soils

formed in silty material that contains some stratified sand and silt below a depth of 4 feet.

Some alluvial material has accumulated at the foot of the slope on which it originated. This material, called local alluvium, retains many characteristics of the soils in the areas from which it has eroded. Olmitz soils formed in this material. They are at the foot of slopes, directly below soils that formed in glacial till.

When streams overflow their channels and water spreads over the flood plains, the coarse textured material is deposited first. Fine textured material, such as silt, is deposited when the floodwater moves more slowly. After the floodwater has receded, the finest particles, or clay, settle from the water left standing on the lowest part of the flood plain. Ackmore and Nodaway soils formed in silty material, and Shaffton soils formed in loamy material. Colo and Zook soils are on the lowest part of the flood plain. They have a solum of silty clay loam or silty clay and contain more clay than the soils on the higher part of the flood plain.

The sandy eolian material is in the uplands and on terraces. In the uplands it occurs as low mounds or dunes and is underlain by till at varying depths. It also occurs in areas intermingled with areas of loess soils. The sand in these eolian deposits is largely quartz, which is fine or very fine in size and is highly resistant to weathering. It has not been altered appreciably since it was deposited. Chelsea, Dickinson, and Sparta soils mainly formed in this material.

Residuum is material derived from sedimentary rock that weathered in place. It is a very minor parent material in the county. The underlying bedrock for three-fourths of the county is from the Silurian System. That for the other fourth, which is in the southern part of the county, is from the Devonian and Pennsylvanian Systems. These three systems mainly are made up of limestone, dolomite, and a small amount of shale. They are not level but generally slope to the southwest at a rate of about 20 feet per mile. The Pennsylvanian System has some coalbeds. Some of these coalbeds were mined at one time in the county. Nordness soils formed partly in residuum.

Climate

The soils in Scott County formed under the influence of a midcontinental, subhumid climate for at least 5,000 years. Between 5,000 and 16,000 years ago, the climate was conducive to the growth of forest vegetation *(5)*. The morphology of most of the soils in the county indicates that the climate under which the soils formed is similar to the present one. The climate generally is uniform throughout the county but is marked by wide seasonal extremes in temperature.

Climate is a major factor in determining which soils form in the various kinds of parent material. It affects the rate and intensity of hydrolysis, carbonation, oxidation, and other important chemical reactions in the soil. Temperature, rainfall, relative humidity, and length of the frost-free period affect the kind of vegetation on the soil.

The influence of the climate of the region is somewhat modified by local conditions. For example, soils on south-facing, dry, sandy slopes formed under a microclimate that is warmer and drier than the average climate in nearby areas. Poorly drained soils in low areas formed under a climate that is wetter and colder than that in most of the surrounding areas. These local conditions account for some of the differences among soils that are within the same general climatic region.

Plant and Animal Life

Living organisms are important to soil formation. They include vegetation, animals, bacteria, and fungi. The vegetation helps to determine the content of organic matter, the color of the surface layer, and the content of nutrients. Earthworms and other burrowing animals help to keep the soil open and porous. Bacteria and fungi decompose the vegetation and thereby release nutrients for plant food.

Most of the soils in Scott County formed under prairie grasses or a mixture of prairie grasses and water-tolerant plants. Many decayed roots and tops of grasses are on or in the soils. As a result, the surface layer of these soils is thick and dark. Muscatine and Tama soils are examples of these soils.

The soils that formed under trees have a thinner, lighter colored surface layer. The organic matter, derived principally from leaves, was deposited on the surface of the soil. Fayette and Lindley soils are examples of soils that formed under trees.

Downs, Fayette, and Tama soils formed in the same parent material and, except for the native vegetation, under similar conditions. Differences in native vegetation account for the main morphological differences among these soils.

Relief

Relief influences soil formation, mainly through its effect on drainage, runoff, and erosion. In Scott County, the relief ranges from level to very steep. Water soaks into the level and nearly level soils in areas that are not flooded. Where the slope is steeper, more water runs off and less penetrates the soils.

Garwin, Muscatine, and Tama soils, which formed in the same kind of parent material and under similar vegetation, differ from one another because of relief

and position on the landscape. The level and nearly level Garwin soils are on broad, high upland flats. The nearly level and level Muscatine soils are on ridges and long, gentle, concave slopes. The gently sloping to strongly sloping Tama soils are on uplands.

In depressions that collect and impound water, the soils are poorly drained and have a distinct, light colored subsurface layer and a gray subsoil. Walford soils, for example, formed in depressions.

Steeply sloping soils show little evidence of soil formation. Most of the precipitation runs off. Exette soils are examples of these soils.

Soils that formed in alluvium, such as Ackmore, Colo, and Shaffton soils, are on flood plains. The microrelief of these nearly level soils affects the runoff rate, depth to the water table, and the amount of new sediment that is added. Colo soils are at low elevations. They are poorly drained, have a high water table, and impound water for short periods. Shaffton soils are at the slightly higher elevations. They are somewhat poorly drained.

Aspect also has a significant effect on soil formation. South-facing slopes generally are warmer and drier than north-facing slopes. As a result, they support a different kind and amount of vegetation.

The influence of a porous, rapidly permeable parent material can override the influence of relief. Even though they are nearly level to moderately steep, Sparta soils, for example, are excessively drained because they are very rapidly permeable.

Time

The length of time that soil material remains in place and is acted on by soil-forming processes affects the kind of soil that forms. The older soils have more strongly expressed genetic horizons. Downs, Fayette, and Tama soils are examples.

A less well developed soil has only weakly expressed horizons. Some soils that formed in alluvium show little or no evidence of soil formation because fresh material is deposited periodically. They have not been in place long enough for climate and vegetation to produce well defined genetic horizons. Nodaway soils, which formed in alluvium, are very young. In the steeper areas where soil material is removed, a deep soil cannot form. Exette and Nordness soils are examples of these soils.

The resistance of parent material to weathering can modify the effect of time. Soils that formed in material resistant to weathering, such as quartz sand, do not change much with time. Chelsea and Sparta soils are examples.

In areas where buried organic matter has been deposited by ice, water, or wind, the age of a landscape can be determined by radiocarbon dating the organic material *(8)*.

The loess in which Downs, Fayette, and Tama soils formed is probably 14,000 to 20,000 years old. A part of the Iowan erosional surface formed when the loess was deposited *(7)*. The Iowan erosional surface beneath the loess ranges in age from 14,000 to more than 30,000 years before present. The end of the major period of loess deposition in Iowa was about 14,000 years ago. The surfaces not covered by loess are younger than the loess. They are less than 14,000 years old. Kenyon soils formed in this material.

Human Activities

Important changes took place after the county was settled. Some changes had little effect on soil productivity, and others had drastic effects.

Changes caused by water erosion are the most important. In sloping areas, cultivation increases the susceptibility of the soils to erosion, which removes the topsoil, organic matter, and plant nutrients. Sheet erosion, which is prevalent in the county, removes a fraction of an inch to a few inches of topsoil at a time, but cultivation generally destroys all evidence of this loss. In some areas, shallow to deep gullies have formed. The eroded material has been deposited on the lower slopes.

Exette and Timula soils may be the result of human activities. The action of sheet erosion and gully and rill erosion on these soils followed by the smoothing of these areas over many years of intensive row cropping may have caused the loss of the original surface layer. The subsoil of the Exette and Timula soils is very similar to the substratum of the Downs, Fayette, and Tama soils. The Timula soils have in the subsoil, and in some cases in the surface layer, the secondary lime concretion that typically is at a depth of more than 5 to 8 feet.

Soil blowing also can occur after the soils are cultivated. Sandy soils are highly susceptible to soil blowing, especially if the surface is bare and the topsoil is dry. If nearly level fields are plowed in the fall, the dark topsoil is mixed with the snow or piled along fence rows and in roadside ditches.

In fields that are cultivated year after year, the well developed granular structure of the surface layer, which is apparent in virgin grassland, begins to break down. The surface layer is baked and hard when dry. The fine textured soils that are plowed when wet tend to puddle and are less permeable than soils in undisturbed areas.

In some fields a compact layer that hardens as it dries and is less permeable than the subsoil forms

below the plow layer. This layer is called a plowsole or plowpan.

In Scott County, Ackmore and Dockery soils show the influence of cultivation. Strata of light and dark material that washed from hillsides and was deposited by floods overlie the original dark soil. This erosion began to occur after the hillsides were cultivated.

Management practices have increased the productivity of some areas and of reclaimed areas that otherwise were not suited to crops. Drainage ditches and diversions at the foot of slopes help to prevent flooding in low areas. As a result, flood plains can be used for cultivated crops. Additions of commercial fertilizer counteract deficiencies in plant nutrients so that soils can be more productive. In many places dark soils on flood plains have received deposits of lighter colored soil material.

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Glossary

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

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Coarse textured soil. Sand or loamy sand.

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.

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.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

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.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

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.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low strength. The soil is not strong enough to support loads.

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.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The organic matter content is estimated for surface horizons that are 0 to 7 inches thick and that have been cultivated for more than 20 years.

Parent material. The unconsolidated organic and mineral material in which soil forms.

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

Phosphorus. The amount of phosphorus available to plants at a depth of 30 to 42 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available phosphorus are:

Very low	less than 7.5 ppm
Low	7.5 to 13.0 ppm
Medium	13.0 to 22.5 ppm
High	more than 22.5 ppm

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

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.

Potassium. The amount of potassium available to plants at a depth of 12 to 24 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available potassium are:

Very low	less than 50 ppm
Low	50 to 79 ppm
Medium	79 to 125 ppm
High	more than 125 ppm

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

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.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the 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.

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.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, 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.

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.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

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.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration. The description of tilth is based on the content of clay, organic matter, and sand; the drainage class; and the size of the sand grains.

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.

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.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-84 at Davenport, Iowa)

Month	Temperature						Precipitation				
				2 years in 10 will have--		Average		2 years in 10 will have--		Average	
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	number of growing degree days*	Average	Less than--	More than--	number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	28.6	12.5	20.6	56	-17	0	1.39	0.54	2.10	4	8.8
February----	34.4	18.0	26.2	61	-10	0	1.07	.49	1.57	4	5.3
March-------	44.6	27.6	36.1	78	3	21	2.31	1.01	3.41	6	5.4
April-------	60.0	40.8	50.4	86	24	109	3.47	2.10	4.69	7	.9
May---------	72.2	52.4	62.3	90	35	392	3.68	2.04	5.12	8	.0
June--------	81.3	61.8	71.6	95	46	648	4.13	2.26	5.76	7	.0
July--------	85.1	66.7	75.9	97	54	803	4.36	2.53	5.98	7	.0
August------	83.2	64.7	74.0	96	52	744	3.65	1.48	5.47	6	.0
September---	75.8	56.3	66.1	94	39	483	3.39	1.37	5.11	5	.0
October-----	64.5	45.0	54.8	86	27	199	2.62	.74	4.15	5	.1
November----	48.0	31.8	39.9	73	9	12	2.03	.97	2.93	4	1.7
December----	34.5	19.7	27.1	63	-9	0	1.76	.79	2.59	4	6.1
Yearly:											
Average---	59.4	41.4	50.4	---	---	---	---	---	---	---	---
Extreme---	---	---	---	98	-17	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,411	33.86	27.82	39.35	67	28.3

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-84 at Davenport, 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. 7	Apr. 16	Apr. 25
2 years in 10 later than--	Apr. 3	Apr. 12	Apr. 21
5 years in 10 later than--	Mar. 25	Apr. 4	Apr. 14
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 31	Oct. 22	Oct. 14
2 years in 10 earlier than--	Nov. 4	Oct. 27	Oct. 18
5 years in 10 earlier than--	Nov. 13	Nov. 4	Oct. 27

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-84 at Davenport, 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	213	195	178
8 years in 10	219	201	184
5 years in 10	231	212	195
2 years in 10	243	224	206
1 year in 10	250	230	212

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
11B	Colo-Ely complex, 0 to 5 percent slopes	5,490	1.8
20C2	Killduff silty clay loam, 5 to 9 percent slopes, moderately eroded	3,110	1.0
20C3	Killduff silty clay loam, 5 to 9 percent slopes, severely eroded	840	0.3
20D2	Killduff silty clay loam, 9 to 14 percent slopes, moderately eroded	1,860	0.6
20D3	Killduff silty clay loam, 9 to 14 percent slopes, severely eroded	4,350	1.5
24D3	Shelby clay loam, 9 to 14 percent slopes, severely eroded	260	0.1
24E2	Shelby loam, 14 to 18 percent slopes, moderately eroded	210	0.1
24E3	Shelby clay loam, 14 to 18 percent slopes, severely eroded	550	0.2
41	Sparta loamy fine sand, 0 to 2 percent slopes	270	0.1
41B	Sparta loamy fine sand, 2 to 5 percent slopes	1,220	0.4
41C	Sparta loamy fine sand, 5 to 9 percent slopes	1,640	0.5
41D	Sparta loamy fine sand, 9 to 14 percent slopes	230	0.1
54	Zook silty clay loam, 0 to 2 percent slopes	880	0.3
63C	Chelsea loamy fine sand, 5 to 9 percent slopes	150	0.1
63E	Chelsea loamy fine sand, 9 to 18 percent slopes	250	0.1
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded	380	0.1
65F	Lindley loam, 18 to 25 percent slopes	660	0.2
65G	Lindley loam, 25 to 40 percent slopes	2,330	0.8
83B	Kenyon loam, 2 to 5 percent slopes	290	0.1
83C2	Kenyon loam, 5 to 9 percent slopes, moderately eroded	1,020	0.3
83D2	Kenyon loam, 9 to 14 percent slopes, moderately eroded	300	0.1
83D3	Kenyon loam, 9 to 14 percent slopes, severely eroded	510	0.2
84	Clyde clay loam, 0 to 3 percent slopes	890	0.3
118	Garwin silty clay loam, 0 to 2 percent slopes	11,200	3.6
119	Muscatine silty clay loam, 0 to 2 percent slopes	24,040	7.8
119B	Muscatine silty clay loam, 2 to 5 percent slopes	2,320	0.8
120B	Tama silty clay loam, 2 to 5 percent slopes	42,640	14.0
120B2	Tama silty clay loam, 2 to 5 percent slopes, moderately eroded	1,380	0.5
120C	Tama silty clay loam, 5 to 9 percent slopes	3,500	1.2
120C2	Tama silty clay loam, 5 to 9 percent slopes, moderately eroded	28,680	9.4
120C3	Tama silty clay loam, 5 to 9 percent slopes, severely eroded	230	0.1
120D2	Tama silty clay loam, 9 to 14 percent slopes, moderately eroded	5,730	1.9
120D3	Tama silty clay loam, 9 to 14 percent slopes, severely eroded	2,090	0.7
120E2	Tama silty clay loam, 14 to 18 percent slopes, moderately eroded	250	0.1
120E3	Tama silty clay loam, 14 to 18 percent slopes, severely eroded	300	0.1
133	Colo silty clay loam, 0 to 2 percent slopes	9,420	3.1
139	Perks sand, 0 to 3 percent slopes	370	0.1
151	Marshan clay loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes	260	0.1
160	Walford silt loam, 0 to 2 percent slopes	620	0.2
162B	Downs silt loam, 2 to 5 percent slopes	4,290	1.4
162C2	Downs silt loam, 5 to 9 percent slopes, moderately eroded	7,130	2.4
162C3	Downs silty clay loam, 5 to 9 percent slopes, severely eroded	250	0.1
162D2	Downs silt loam, 9 to 14 percent slopes, moderately eroded	5,260	1.8
162D3	Downs silty clay loam, 9 to 14 percent slopes, severely eroded	930	0.3
162E2	Downs silt loam, 14 to 18 percent slopes, moderately eroded	1,300	0.4
162E3	Downs silty clay loam, 14 to 18 percent slopes, severely eroded	750	0.3
162F2	Downs silt loam, 18 to 25 percent slopes, moderately eroded	630	0.2
163B2	Fayette silt loam, 2 to 5 percent slopes, moderately eroded	2,280	0.8
163C	Fayette silt loam, 5 to 9 percent slopes	620	0.2
163C2	Fayette silt loam, 5 to 9 percent slopes, moderately eroded	3,730	1.2
163C3	Fayette silty clay loam, 5 to 9 percent slopes, severely eroded	270	0.1
163D	Fayette silt loam, 9 to 14 percent slopes	490	0.2
163D2	Fayette silt loam, 9 to 14 percent slopes, moderately eroded	2,280	0.8
163D3	Fayette silty clay loam, 9 to 14 percent slopes, severely eroded	750	0.3
163E	Fayette silt loam, 14 to 18 percent slopes	630	0.2
163E2	Fayette silt loam, 14 to 18 percent slopes, moderately eroded	1,650	0.6
163E3	Fayette silty clay loam, 14 to 18 percent slopes, severely eroded	800	0.3
163F	Fayette silt loam, 18 to 25 percent slopes	720	0.2
163F2	Fayette silt loam, 18 to 25 percent slopes, moderately eroded	960	0.3
163F3	Fayette silty clay loam, 18 to 25 percent slopes, severely eroded	320	0.1
163G	Fayette silt loam, 25 to 40 percent slopes	1,890	0.6
174	Bolan loam, 0 to 2 percent slopes	520	0.2
175	Dickinson fine sandy loam, 0 to 2 percent slopes	640	0.2
175B	Dickinson fine sandy loam, 2 to 5 percent slopes	1,890	0.6

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
175C	Dickinson fine sandy loam, 5 to 9 percent slopes	1,200	0.4
179D2	Gara loam, 9 to 14 percent slopes, moderately eroded	210	0.1
179E2	Gara loam, 14 to 18 percent slopes, moderately eroded	350	0.1
179E3	Gara clay loam, 14 to 18 percent slopes, severely eroded	360	0.1
179F2	Gara loam, 18 to 25 percent slopes, moderately eroded	320	0.1
179F3	Gara clay loam, 18 to 25 percent slopes, severely eroded	260	0.1
184	Klinger silty clay loam, 0 to 3 percent slopes	430	0.1
220	Nodaway silt loam, 0 to 2 percent slopes	1,540	0.5
225	Lawler loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes	1,200	0.4
254	Zook silty clay, sandy substratum, 0 to 2 percent slopes	1,100	0.4
273C	Olmitz loam, 3 to 9 percent slopes	540	0.2
284	Flagler sandy loam, 0 to 2 percent slopes	1,210	0.4
291	Atterberry silt loam, 0 to 2 percent slopes	1,980	0.7
293C	Chelsea-Lamont-Fayette, sandy substratum, complex, 5 to 9 percent slopes	390	0.1
293E	Chelsea-Lamont-Fayette, sandy substratum, complex, 9 to 18 percent slopes	560	0.2
293F	Chelsea-Lamont-Fayette, sandy substratum, complex, 18 to 25 percent slopes	500	0.2
313G	Gosport silt loam, 25 to 40 percent slopes	500	0.2
352B	Whittier silt loam, 2 to 5 percent slopes	240	0.1
352C2	Whittier silt loam, 5 to 9 percent slopes, moderately eroded	250	0.1
354	Aquolls, ponded	1,250	0.4
377B	Dinsdale silty clay loam, 2 to 5 percent slopes	2,140	0.7
377C	Dinsdale silty clay loam, 5 to 9 percent slopes	1,080	0.4
377C2	Dinsdale silty clay loam, 5 to 9 percent slopes, moderately eroded	1,210	0.4
382	Maxfield silty clay loam, 0 to 2 percent slopes	220	0.1
420B	Tama silty clay loam, benches, 2 to 5 percent slopes	640	0.2
426B	Aredale silt loam, 2 to 5 percent slopes	550	0.2
426C	Aredale silt loam, 5 to 9 percent slopes	390	0.1
426C2	Aredale silt loam, 5 to 9 percent slopes, moderately eroded	510	0.2
426D2	Aredale silt loam, 9 to 14 percent slopes, moderately eroded	200	0.1
428B	Ely silty clay loam, 2 to 5 percent slopes	1,740	0.6
430	Ackmore silt loam, 0 to 2 percent slopes	5,200	1.7
430B	Ackmore silt loam, 2 to 5 percent slopes	2,480	0.8
442C2	Tama, sandy substratum-Dickinson complex, 5 to 9 percent slopes, moderately eroded	870	0.3
442D2	Tama, sandy substratum-Dickinson complex, 9 to 14 percent slopes, moderately eroded	880	0.3
442E2	Tama, sandy substratum-Dickinson complex, 14 to 18 percent slopes, moderately eroded	470	0.2
450B	Pillot silt loam, 2 to 5 percent slopes	300	0.1
450C2	Pillot silt loam, 5 to 9 percent slopes, moderately eroded	220	0.1
484	Lawson silt loam, 0 to 2 percent slopes	850	0.3
499G	Nordness silt loam, 18 to 40 percent slopes	160	0.1
539	Perks sandy loam, 0 to 3 percent slopes	810	0.3
673D3	Timula silt loam, 9 to 14 percent slopes, severely eroded	600	0.2
673E3	Timula silt loam, 14 to 18 percent slopes, severely eroded	2,150	0.7
673F3	Timula silt loam, 18 to 25 percent slopes, severely eroded	270	0.1
763E3	Exette silt loam, 14 to 18 percent slopes, severely eroded	2,520	0.8
763F3	Exette silt loam, 18 to 25 percent slopes, severely eroded	890	0.3
767E3	Mula silt loam, 14 to 18 percent slopes, severely eroded	510	0.2
767F3	Mula silt loam, 18 to 25 percent slopes, severely eroded	270	0.1
814	Rockton loam, 0 to 3 percent slopes	230	0.1
820	Dockery silt loam, 0 to 2 percent slopes	1,170	0.4
820B	Dockery silt loam, 2 to 5 percent slopes	4,260	1.4
826	Rowley silt loam, 0 to 2 percent slopes	2,670	0.9
916B	Downs silt loam, sandy substratum, 2 to 5 percent slopes	240	0.1
916C2	Downs silt loam, sandy substratum, 5 to 9 percent slopes, moderately eroded	280	0.1
916D2	Downs silt loam, sandy substratum, 9 to 14 percent slopes, moderately eroded	200	0.1
920B	Tama silty clay loam, sandy substratum, 2 to 5 percent slopes	3,080	1.0
920C2	Tama silty clay loam, sandy substratum, 5 to 9 percent slopes, moderately eroded	1,450	0.5
920D2	Tama silty clay loam, sandy substratum, 9 to 14 percent slopes, moderately eroded	210	0.1
926	Canoe silt loam, 0 to 2 percent slopes	540	0.2
950	Niota silt loam, 0 to 2 percent slopes	340	0.1
950B	Niota silt loam, 2 to 5 percent slopes	180	0.1
960	Shaffton loam, 0 to 2 percent slopes	1,550	0.5
961	Ambraw clay loam, 0 to 2 percent slopes	2,690	0.9

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
977	Richwood silt loam, 0 to 2 percent slopes	2,450	0.8
1118	Garwin silty clay loam, benches, 0 to 2 percent slopes	590	0.2
1119	Muscatine silty clay loam, benches, 0 to 2 percent slopes	960	0.3
1539	Ambraw-Perks-Lawson complex, frequently flooded, 0 to 2 percent slopes	6,300	2.1
1730B	Nodaway-Perks complex, channeled, 0 to 5 percent slopes	630	0.2
4000	Urban land	5,160	1.7
4133	Colo-Urban land complex, 0 to 2 percent slopes	150	0.1
4162C	Downs-Urban land complex, 2 to 9 percent slopes	4,260	1.4
4162D	Downs-Urban land complex, 9 to 14 percent slopes	2,250	0.8
4163E	Fayette-Urban land complex, 14 to 25 percent slopes	1,000	0.3
4220	Nodaway-Urban land complex, 0 to 3 percent slopes	770	0.3
4291	Atterberry-Urban land complex, 0 to 2 percent slopes	660	0.2
4977B	Richwood-Urban land complex, 1 to 5 percent slopes	1,590	0.5
5010	Pits, sand and gravel	80	*
5030	Pits, limestone quarries	790	0.3
5040	Orthents, loamy	2,790	0.9
5080	Orthents, nearly level	160	0.1
	Water	6,000	2.0
	Total	299,900	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
11B	Colo-Ely complex, 0 to 5 percent slopes (where drained)
54	Zook silty clay loam, 0 to 2 percent slopes (where drained)
83B	Kenyon loam, 2 to 5 percent slopes
84	Clyde clay loam, 0 to 3 percent slopes (where drained)
118	Garwin silty clay loam, 0 to 2 percent slopes (where drained)
119	Muscatine silty clay loam, 0 to 2 percent slopes
119B	Muscatine silty clay loam, 2 to 5 percent slopes
120B	Tama silty clay loam, 2 to 5 percent slopes
120B2	Tama silty clay loam, 2 to 5 percent slopes, moderately eroded
133	Colo silty clay loam, 0 to 2 percent slopes (where drained)
151	Marshan clay loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes (where drained)
160	Walford silt loam, 0 to 2 percent slopes (where drained)
162B	Downs silt loam, 2 to 5 percent slopes
163B2	Fayette silt loam, 2 to 5 percent slopes, moderately eroded
174	Bolan loam, 0 to 2 percent slopes
175	Dickinson fine sandy loam, 0 to 2 percent slopes
175B	Dickinson fine sandy loam, 2 to 5 percent slopes
184	Klinger silty clay loam, 0 to 3 percent slopes
220	Nodaway silt loam, 0 to 2 percent slopes
225	Lawler loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes
254	Zook silty clay, sandy substratum, 0 to 2 percent slopes (where drained)
291	Atterberry silt loam, 0 to 2 percent slopes
352B	Whittier silt loam, 2 to 5 percent slopes
377B	Dinsdale silty clay loam, 2 to 5 percent slopes
382	Maxfield silty clay loam, 0 to 2 percent slopes (where drained)
420B	Tama silty clay loam, benches, 2 to 5 percent slopes
426B	Aredale silt loam, 2 to 5 percent slopes
428B	Ely silty clay loam, 2 to 5 percent slopes
430	Ackmore silt loam, 0 to 2 percent slopes
430B	Ackmore silt loam, 2 to 5 percent slopes
450B	Pillot silt loam, 2 to 5 percent slopes
484	Lawson silt loam, 0 to 2 percent slopes
814	Rockton loam, 0 to 3 percent slopes
820	Dockery silt loam, 0 to 2 percent slopes
820B	Dockery silt loam, 2 to 5 percent slopes
826	Rowley silt loam, 0 to 2 percent slopes
916B	Downs silt loam, sandy substratum, 2 to 5 percent slopes
920B	Tama silty clay loam, sandy substratum, 2 to 5 percent slopes
926	Canoe silt loam, 0 to 2 percent slopes
960	Shaffton loam, 0 to 2 percent slopes
961	Ambraw clay loam, 0 to 2 percent slopes (where drained)
977	Richwood silt loam, 0 to 2 percent slopes
1118	Garwin silty clay loam, benches, 0 to 2 percent slopes (where drained)
1119	Muscatine silty clay loam, benches, 0 to 2 percent slopes

TABLE 6.--LAND CAPABILITY, CORN SUITABILITY RATING, 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 suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth brome	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
11B---------- Colo-Ely	IIw	68	140	47	84	4.2	3.4	5.7	7.0
20C2---------- Killduff	IIIe	73	153	51	92	6.4	3.8	6.3	10.7
20C3---------- Killduff	IIIe	70	145	49	87	6.1	3.6	5.9	10.2
20D2---------- Killduff	IIIe	63	144	48	86	6.1	3.5	5.9	10.1
20D3---------- Killduff	IVe	58	136	46	82	5.7	3.3	5.6	9.5
24D3---------- Shelby	IVe	45	107	33	64	4.5	2.6	4.4	7.5
24E2---------- Shelby	IVe	38	98	30	59	4.1	2.4	4.0	6.9
24E3---------- Shelby	VIe	35	---	---	---	3.8	2.2	3.7	6.3
41---------- Sparta	IVs	45	80	27	48	3.4	2.0	3.3	5.6
41B---------- Sparta	IVs	40	77	26	46	3.2	1.9	3.2	5.4
41C---------- Sparta	IVs	25	72	24	43	3.0	1.8	3.0	5.1
41D---------- Sparta	VIs	15	---	---	---	2.6	1.5	2.6	4.4
54---------- Zook	IIw	70	126	42	63	3.8	3.1	5.2	6.3
63C---------- Chelsea	IVs	21	63	21	38	2.6	1.5	2.6	4.4
63E---------- Chelsea	VIIs	5	---	---	---	---	0.9	---	---

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth brome	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
65E2---------- Lindley	VIe	28	---	---	---	3.4	2.0	3.3	5.6
65F---------- Lindley	VIIe	10	---	---	---	---	1.8	---	---
65G---------- Lindley	VIIe	5	---	---	---	---	1.7	---	---
83B---------- Kenyon	IIe	87	157	48	94	6.6	3.9	6.4	11.0
83C2---------- Kenyon	IIIe	69	148	45	89	6.2	3.6	6.1	10.4
83D2---------- Kenyon	IIIe	59	139	42	83	5.8	3.4	5.7	9.8
83D3---------- Kenyon	IVe	56	131	40	79	5.5	3.2	5.4	9.2
84---------- Clyde	IIw	75	140	43	84	4.2	3.4	5.7	7.0
118---------- Garwin	IIw	95	167	56	100	5.0	4.1	6.8	8.4
119---------- Muscatine	I	100	170	57	102	6.8	4.2	7.0	11.4
119B---------- Muscatine	IIe	95	167	56	100	6.7	4.1	6.8	11.2
120B---------- Tama	IIe	95	167	56	100	7.0	4.1	6.9	11.7
120B2---------- Tama	IIe	93	163	55	98	6.9	4.0	6.7	11.4
120C---------- Tama	IIIe	80	162	54	97	6.8	4.0	6.6	11.4
120C2---------- Tama	IIIe	78	158	53	95	6.6	3.9	6.5	11.1
120C3---------- Tama	IVe	75	150	50	90	6.3	3.7	6.2	10.5
120D2---------- Tama	IIIe	68	149	50	89	6.3	3.7	6.1	10.5

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth brome	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
120D3---------- Tama	IVe	65	141	47	85	5.9	3.5	5.8	9.9
120E2---------- Tama	IVe	58	132	44	79	5.7	3.2	5.4	9.3
120E3---------- Tama	VIe	55	---	---	---	5.2	3.1	5.1	8.7
133---------- Colo	IIw	80	136	46	82	4.1	3.4	5.6	6.8
139---------- Perks	IVs	15	50	17	30	2.1	1.2	2.1	3.5
151---------- Marshan	IIw	64	112	34	67	3.4	2.8	4.6	5.6
160---------- Walford	IIIw	65	128	43	77	3.8	3.2	5.2	6.4
162B---------- Downs	IIe	90	158	53	95	6.6	3.9	6.5	11.1
162C2---------- Downs	IIIe	73	149	50	89	6.3	3.7	6.1	10.5
162C3---------- Downs	IVe	70	141	47	85	5.9	3.5	5.8	9.9
162D2---------- Downs	IIIe	63	140	47	84	5.9	3.4	5.7	9.8
162D3---------- Downs	IVe	60	132	44	79	5.5	3.2	5.4	9.3
162E2---------- Downs	IVe	53	123	41	74	5.2	3.0	5.0	8.6
162E3---------- Downs	VIe	45	---	---	---	4.8	2.8	4.7	8.1
162F2---------- Downs	VIe	33	---	---	---	4.7	2.8	4.6	7.9
163B2---------- Fayette	IIe	83	145	49	87	6.1	3.6	5.9	10.2
163C---------- Fayette	IIIe	70	144	48	86	6.0	3.5	5.9	10.1

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth brome	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
163C2---------- Fayette	IIIe	68	140	47	84	5.9	3.4	5.7	9.8
163C3---------- Fayette	IVe	65	132	44	79	5.5	3.2	5.4	9.3
163D---------- Fayette	IIIe	60	135	45	81	5.7	3.3	5.5	9.5
163D2---------- Fayette	IIIe	58	131	44	79	5.5	3.2	5.4	9.2
163D3---------- Fayette	IVe	55	123	41	74	5.2	3.0	5.0	8.6
163E---------- Fayette	IVe	50	118	40	71	5.0	2.9	4.8	8.3
163E2---------- Fayette	IVe	48	114	38	68	4.8	2.8	4.7	8.0
163E3---------- Fayette	VIe	45	---	---	---	4.5	2.6	4.3	7.4
163F---------- Fayette	VIe	30	---	---	---	4.5	2.7	4.4	7.6
163F2---------- Fayette	VIe	28	---	---	---	4.4	2.6	4.3	7.3
163F3---------- Fayette	VIe	25	---	---	---	---	2.4	---	---
163G---------- Fayette	VIIe	20	---	---	---	---	2.5	4.2	7.2
174---------- Bolan	IIs	75	124	38	75	5.2	3.1	5.1	8.7
175---------- Dickinson	IIIs	60	112	38	67	4.7	2.8	4.6	7.9
175B---------- Dickinson	IIIe	55	109	37	65	4.6	2.7	4.5	7.7
175C---------- Dickinson	IIIe	40	104	35	62	4.4	2.6	4.3	7.3
179D2---------- Gara	IVe	43	106	32	64	4.5	2.6	4.3	7.4

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth brome	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
179E2--- Gara	VIe	33	---	---	---	3.7	2.2	3.6	6.2
179E3--- Gara	VIe	30	---	---	---	3.4	2.0	3.3	5.7
179F2--- Gara	VIIe	13	---	---	---	---	1.9	---	---
179F3--- Gara	VIIe	5	---	---	---	---	1.7	---	---
184--- Klinger	I	95	168	56	101	6.7	4.1	6.9	11.2
220--- Nodaway	IIw	87	153	51	92	6.4	3.8	6.3	10.7
225--- Lawler	IIs	66	119	36	71	4.8	2.9	4.9	8.0
254--- Zook	IIIw	62	109	37	65	3.3	2.7	4.5	5.5
273C--- Olmitz	IIIe	57	132	44	66	5.5	3.2	5.4	9.3
284--- Flagler	IIIs	50	87	29	52	3.7	2.1	3.6	6.1
291--- Atterberry	I	95	153	44	85	6.1	3.8	6.3	10.2
293C--- Chelsea-Lamont-Fayette	IIIe	41	98	---	---	4.1	2.4	4.0	6.9
293E--- Chelsea-Lamont-Fayette	VIe	21	---	---	---	3.0	1.8	3.0	5.1
293F--- Chelsea-Lamont-Fayette	VIIe	11	---	---	---	---	1.5	---	---
313G--- Gosport	VIIe	5	---	---	---	---	0.7	---	---
352B--- Whittier	IIe	63	133	45	80	5.6	3.3	5.5	9.3

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth brome	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
352C2---------- Whittier	IIIe	38	124	42	74	5.2	3.1	5.1	8.7
354***---------- Aquolls	VIIw	5	---	---	---	---	---	---	---
377B---------- Dinsdale	IIe	90	160	54	96	6.7	3.9	6.6	10.9
377C---------- Dinsdale	IIIe	75	155	52	93	6.5	3.8	6.4	10.9
377C2---------- Dinsdale	IIIe	73	151	51	91	6.3	3.7	6.2	10.6
382---------- Maxfield	IIw	90	160	54	96	4.8	3.9	6.6	8.0
420B---------- Tama	IIe	95	167	56	100	7.0	4.1	6.8	11.7
426B---------- Aredale	IIe	85	149	45	89	6.3	3.7	6.1	10.5
426C---------- Aredale	IIIe	70	144	44	86	6.0	3.5	5.9	10.1
426C2---------- Aredale	IIIe	68	140	43	84	5.9	3.4	5.7	9.8
426D2---------- Aredale	IIIe	58	131	40	79	5.5	3.2	5.4	9.2
428B---------- Ely	IIe	88	159	53	87	6.4	3.9	6.5	10.6
430---------- Ackmore	IIw	83	141	47	71	5.6	3.5	5.8	9.4
430B---------- Ackmore	IIw	78	138	46	69	5.5	3.4	5.7	9.2
442C2---------- Tama-Dickinson	IIIe	58	130	42	75	5.5	3.2	5.3	9.1
442D2---------- Tama-Dickinson	IVe	48	121	39	69	5.1	3.0	5.0	8.5
442E2---------- Tama-Dickinson	IVe	38	104	39	69	4.4	2.6	4.3	7.3

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth brome	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
450B---------- Pillot	IIe	68	142	36	74	6.1	3.5	5.8	10.0
450C2---------- Pillot	IIIe	46	133	32	67	5.6	3.3	5.5	9.3
484---------- Lawson	IIw	90	157	43	80	6.3	3.9	6.4	10.5
499G---------- Nordness	VIIs	5	---	---	---	---	0.5	---	---
539---------- Perks	IIIs	20	60	20	36	2.5	1.5	2.5	4.2
673D3---------- Timula	IVe	50	112	38	67	4.7	2.8	4.6	7.9
673E3---------- Timula	VIe	40	---	---	---	4.0	2.3	3.9	6.7
673F3---------- Timula	VIe	20	---	---	---	3.6	2.1	3.5	6.0
763E3---------- Exette	VIe	40	---	---	---	4.2	2.5	4.1	7.1
763F3---------- Exette	VIe	21	---	---	---	3.8	2.2	3.7	6.4
767E3---------- Mula	VIe	37	---	---	---	3.9	2.3	3.8	6.5
767F3---------- Mula	VIe	17	---	---	---	3.4	2.0	3.4	5.8
814---------- Rockton	IIs	71	120	37	72	5.0	3.0	4.9	8.4
820---------- Dockery	IIw	80	138	46	83	5.5	3.4	5.7	9.2
820B---------- Dockery	IIw	75	135	45	81	5.4	3.3	5.5	9.0
826---------- Rowley	IIw	95	126	54	97	6.5	4.0	10.8	10.8
916B---------- Downs	IIe	77	136	46	82	5.7	3.3	5.6	9.5

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth brome	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
916C2---------- Downs	IIIe	62	127	43	76	5.3	3.1	5.2	8.9
916D2---------- Downs	IIIe	52	118	40	71	5.0	2.9	4.8	8.3
920B---------- Tama	IIe	82	145	49	87	6.1	3.6	5.9	10.2
920C2---------- Tama	IIIe	57	136	46	82	5.7	3.3	5.6	9.5
920D2---------- Tama	IIIe	47	127	43	76	53	3.1	5.2	8.9
926---------- Canoe	I	90	153	51	92	6.1	3.8	6.3	10.2
950---------- Niota	IIIw	45	85	28	51	2.6	2.1	3.5	4.3
950B---------- Niota	IIIw	40	82	27	49	2.5	2.0	3.4	4.1
960---------- Shaffton	IIw	78	130	40	78	5.2	3.2	5.3	8.7
961---------- Ambraw	IIw	47	110	37	66	3.3	2.7	4.5	5.5
977---------- Richwood	I	95	162	54	97	6.8	4.0	6.6	11.4
1118---------- Garwin	IIw	95	167	56	100	5.0	4.1	6.8	8.4
1119---------- Muscatine	I	100	170	57	102	6.8	4.2	7.0	11.4
1539---------- Ambraw-Perks-Lawson	Vw	25	---	---	---	---	2.8	---	---
1730B---------- Nodaway-Perks	Vw	25	---	---	---	---	2.5	---	---
4000***. Urban land									
4133. Colo-Urban land									

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY, CORN SUITABILITY RATING, AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn suitability rating	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth brome	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
4162C, 4162D. Downs-Urban land complex									
4163E. Fayette-Urban land complex									
4220. Nodaway-Urban land complex									
4291. Atterberry-Urban land complex									
4977B. Richwood-Urban land complex									
5010***, 5030***. Pits									
5040***. Orthents, loamy									
5080***. Orthents									

* Relative value: The value for the corn suitability rating.

** Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

*** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Productivity class*	
41, 41B, 41C, 41D--Sparta	4S	Slight	Slight	Severe	Slight	Slight	Northern red oak---- Eastern white pine-- Red pine---------- Jack pine----------	70 --- --- ---	4 --- --- ---	Red pine, eastern white pine, jack pine.
63C, 63E----------Chelsea	3S	Slight	Slight	Moderate	Slight	Slight	White oak----------	55	3	Eastern white pine, Scotch pine, European larch, eastern redcedar, red pine, jack pine.
65E2, 65F, 65G-----Lindley	3R	Moderate	Moderate	Slight	Slight	Severe	White oak---------- Northern red oak---- Black oak----------	56 61 63	3 3 3	White oak, northern red oak, black oak.
139----------Perks	3S	Slight	Slight	Moderate	Slight	Slight	White oak----------	55	3	Eastern white pine.
160----------Walford	2W	Slight	Severe	Moderate	Moderate	Severe	Silver maple-------- Eastern cottonwood--	80 90	2 7	Silver maple, eastern cottonwood, golden willow, American sycamore, green ash, northern whitecedar.
162B, 162C2--------Downs	4A	Slight	Slight	Slight	Slight	Moderate	White oak---------- Northern red oak---- Yellow-poplar------- Black walnut--------	80 80 90 ---	4 4 6 ---	Northern red oak, yellow-poplar, eastern white pine, green ash.
162C3----------Downs	4A	Slight	Slight	Slight	Slight	Moderate	White oak---------- Northern red oak---- Yellow-poplar------- Black walnut--------	80 80 90 ---	4 4 6 ---	Eastern white pine, northern red oak, green ash, yellow-poplar.
162D2----------Downs	4A	Slight	Slight	Slight	Slight	Moderate	White oak---------- Northern red oak---- Yellow-poplar------- Black walnut--------	80 80 90 ---	4 4 6 ---	Northern red oak, yellow-poplar, eastern white pine, green ash.
162D3----------Downs	4A	Slight	Slight	Slight	Slight	Moderate	White oak---------- Northern red oak---- Yellow-poplar------- Black walnut--------	80 80 90 ---	4 4 6 ---	Eastern white pine, northern red oak, green ash, yellow-poplar.

See footnotes 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	Plant competition	Common trees	Site index	Productivity class*	
162E2---------- Downs	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak----------	80	4	Northern red oak, yellow-poplar, eastern white pine, green ash.
							Northern red oak----	80	4	
							Yellow-poplar-------	90	6	
							Black walnut--------	---	---	
162E3---------- Downs	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak----------	80	4	Eastern white pine, northern red oak, green ash, yellow-poplar.
							Northern red oak----	80	4	
							Yellow-poplar-------	90	6	
							Black walnut--------	---	---	
162F2---------- Downs	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak----------	80	4	Northern red oak, yellow-poplar, eastern white pine, green ash.
							Northern red oak----	80	4	
							Yellow-poplar-------	90	6	
							Black walnut--------	---	---	
163B2---------- Fayette	4A	Slight	Slight	Slight	Slight	Moderate	White oak----------	80	4	Northern red oak, yellow-poplar, eastern white pine, green ash.
							Northern red oak----	80	4	
							Yellow-poplar-------	90	6	
							Black walnut--------	---	---	
163C---------- Fayette	4A	Slight	Slight	Slight	Slight	Moderate	White oak----------	80	4	Eastern white pine, northern red oak, green ash, yellow-poplar.
							Northern red oak----	80	4	
							Yellow-poplar-------	90	6	
							Black walnut--------	---	---	
163C2---------- Fayette	4A	Slight	Slight	Slight	Slight	Moderate	White oak----------	80	4	Northern red oak, yellow-poplar, eastern white pine, green ash.
							Northern red oak----	80	4	
							Yellow-poplar-------	90	6	
							Black walnut--------	---	---	
163C3, 163D-------- Fayette	4A	Slight	Slight	Slight	Slight	Moderate	White oak----------	80	4	Eastern white pine, northern red oak, green ash, yellow-poplar.
							Northern red oak----	80	4	
							Yellow-poplar-------	90	6	
							Black walnut--------	---	---	
163D2---------- Fayette	4A	Slight	Slight	Slight	Slight	Moderate	White oak----------	80	4	Northern red oak, yellow-poplar, eastern white pine, green ash.
							Northern red oak----	80	4	
							Yellow-poplar-------	90	6	
							Black walnut--------	---	---	
163D3---------- Fayette	4A	Slight	Slight	Slight	Slight	Moderate	White oak----------	80	4	Eastern white pine, northern red oak, green ash, yellow-poplar.
							Northern red oak----	80	4	
							Yellow-poplar-------	90	6	
							Black walnut--------	---	---	
163E---------- Fayette	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak----------	80	4	Eastern white pine, northern red oak, green ash, yellow-poplar.
							Northern red oak----	80	4	
							Yellow-poplar-------	90	6	
							Black walnut--------	---	---	

See footnotes 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	Plant competition	Common trees	Site index	Productivity class*	
163E2--Fayette	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak Northern red oak Yellow-poplar Black walnut	80 80 90 ---	4 4 6 ---	Northern red oak, yellow-poplar, eastern white pine, green ash.
163E3, 163F--Fayette	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak Northern red oak Yellow-poplar Black walnut	80 80 90 ---	4 4 6 ---	Eastern white pine, northern red oak, green ash, yellow-poplar.
163F2--Fayette	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak Northern red oak Yellow-poplar Black walnut	80 80 90 ---	4 4 6 ---	Northern red oak, yellow-poplar, eastern white pine, green ash.
163F3, 163G--Fayette	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak Northern red oak Yellow-poplar Black walnut	80 80 90 ---	4 4 6 ---	Eastern white pine, northern red oak, green ash, yellow-poplar.
179D2--Gara	3A	Slight	Slight	Slight	Slight	Slight	White oak Northern red oak	55 55	3 3	Eastern white pine, red pine, white oak, northern red oak.
179E2--Gara	3R	Moderate	Moderate	Slight	Slight	Slight	White oak Northern red oak	55 55	3 3	Eastern white pine, red pine, white oak, northern red oak.
179E3--Gara	3R	Moderate	Moderate	Slight	Slight	Slight	White oak Northern red oak	55 55	3 3	Eastern white pine, red pine, white oak.
179F2--Gara	3R	Moderate	Moderate	Slight	Slight	Slight	White oak Northern red oak	55 55	3 3	Eastern white pine, red pine, white oak, northern red oak.
179F3--Gara	3R	Moderate	Moderate	Slight	Slight	Slight	White oak Northern red oak	55 55	3 3	Eastern white pine, red pine, white oak.
220--Nodaway	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Eastern white pine, red pine, black walnut, sugar maple, European larch.
291--Atterberry	4A	Slight	Slight	Slight	Slight	Moderate	White oak Northern red oak Green ash Bur oak	70 70 --- ---	4 4 --- ---	Eastern white pine, red pine, Scotch pine, eastern redcedar.

See footnotes 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	Plant competition	Common trees	Site index	Productivity class*	
293C**:										
Chelsea	3R	Moderate	Severe	Moderate	Slight	Slight	White oak	55	3	Eastern white pine, Scotch pine, European larch, eastern redcedar, red pine, jack pine.
Lamont	3R	Moderate	Moderate	Slight	Slight	Moderate	Northern red oak	55	3	Eastern white pine.
							White oak	55	3	
Fayette.										
293E**:										
Chelsea	3S	Slight	Slight	Moderate	Slight	Slight	White oak	55	3	Eastern white pine, Scotch pine, European larch, eastern redcedar, red pine, jack pine.
Lamont	3A	Slight	Slight	Slight	Slight	Moderate	Northern red oak	55	3	Eastern white pine.
							White oak	55	3	
Fayette	4A	Slight	Slight	Slight	Slight	Moderate	White oak	80	4	Northern red oak, yellow-poplar, eastern white pine, green ash.
							Northern red oak	---	---	
							Yellow-poplar	---	---	
							Black walnut	---	---	
293F**:										
Chelsea	3R	Moderate	Severe	Moderate	Slight	Slight	White oak	55	3	Eastern white pine, Scotch pine, European larch, eastern redcedar, red pine, jack pine.
Lamont	3R	Moderate	Moderate	Slight	Slight	Moderate	Northern red oak	55	3	Eastern white pine.
							White oak	55	3	
Fayette.										
313G Gosport	2R	Moderate	Moderate	Severe	Severe	Slight	White oak	45	2	Eastern white pine, red pine, Norway spruce, Scotch pine, white spruce, cottonwood.
352B, 352C2 Whittier	4A	Slight	Slight	Slight	Slight	Moderate	White oak	75	4	Eastern white pine, red pine, black walnut, sugar maple.
							Northern red oak	80	4	

See footnotes 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	Plant competition	Common trees	Site index	Productivity class*	
430, 430B---------- Ackmore	3A	Slight	Slight	Slight	Slight	Moderate	White oak----------	65	3	Eastern white pine, red pine, cottonwood, sugar maple, black walnut.
484---------- Lawson	2A	Slight	Slight	Slight	Slight	Severe	Silver maple--------	70	2	White spruce, silver maple, white ash.
							White ash----------	---	---	
							Red maple----------	---	---	
499G---------- Nordness	2R	Moderate	Moderate	Severe	Severe	Slight	Northern red oak----	45	2	
							White oak----------	45	2	
539---------- Perks	3S	Slight	Slight	Moderate	Slight	Slight	White oak----------	55	3	Eastern white pine.
673D3---------- Timula	4A	Slight	Slight	Slight	Slight	Moderate	White oak----------	70	4	Eastern white pine, red pine, Scotch pine, white oak.
							Northern red oak----	---	---	
							Green ash----------	---	---	
							Bur oak----------	---	---	
673E3, 673F3------- Timula	4R	Moderate	Moderate	Moderate	Slight	Moderate	White oak----------	70	4	Eastern white pine, red pine, Scotch pine, white oak.
							Northern red oak----	---	---	
							Green ash----------	---	---	
							Bur oak----------	---	---	
763E3, 763F3------- Exette	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak----------	80	4	Eastern white pine, red pine, white oak, northern red oak, green ash, black walnut.
							Northern red oak----	80	4	
							Black walnut--------	---	---	
							Green ash----------	---	---	
							Sugar maple---------	---	---	
							American basswood---	---	---	
							Black cherry--------	---	---	
820, 820B---------- Dockery	4A	Slight	Slight	Slight	Slight	Severe	Pin oak----------	76	4	Pin oak, pecan, eastern cottonwood.
826---------- Rowley	2A	Slight	Slight	Slight	Slight	Severe	Silver maple--------	80	2	Silver maple, white ash, eastern cottonwood.
							White ash----------	---	---	
916B---------- Downs	4A	Slight	Slight	Slight	Slight	Moderate	White oak----------	80	4	Eastern white pine, northern red oak, green ash, Scotch pine, yellow-poplar.
							Northern red oak----	80	5	
							Yellow-poplar-------	90	6	
							Black walnut--------	---	---	

See footnotes 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	Wind-throw hazard	Plant competition	Common trees	Site index	Productivity class*	
916C2, 916D2------- Downs	4A	Slight	Slight	Slight	Slight	Moderate	White oak---------- Northern red oak---- Yellow-poplar------- Black walnut--------	80 80 90 ---	4 5 6 ---	Northern red oak, yellow-poplar, eastern white pine, green ash, Scotch pine.
950, 950B---------- Niota	3W	Slight	Severe	Moderate	Moderate	Severe	White oak---------- Pin oak---------- Green ash---------- Yellow-poplar-------	65 80 --- 80	3 4 --- 5	Pin oak, red maple, green ash.
1539**: Ambraw.										
Perks-------------	3S	Slight	Slight	Moderate	Slight	Slight	White oak----------	55	3	Eastern white pine.
Lawson------------	2W	Slight	Moderate	Slight	Slight	Severe	Silver maple------- White ash---------- Red maple----------	70 --- ---	2 --- ---	White spruce, silver maple, white ash.
1730B**: Nodaway-----------	3A	Slight	Slight	Slight	Slight	Moderate	White oak----------	65	3	Eastern white pine, red pine, black walnut, sugar maple, European larch.
Perks-------------	3S	Slight	Slight	Moderate	Slight	Slight	White oak----------	55	3	Eastern white pine.
4162C**, 4162D**: Downs-------------	4A	Slight	Slight	Slight	Slight	Moderate	White oak---------- Northern red oak---- Yellow-poplar------- Black walnut--------	80 80 90 ---	4 4 6 ---	Northern red oak, yellow-poplar, eastern white pine, green ash.
Urban land.										
4163E**: Fayette-----------	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak---------- Northern red oak---- Yellow-poplar------- Black walnut--------	80 80 90 ---	4 4 6 ---	Eastern white pine, northern red oak, green ash, yellow-poplar.
Urban land.										

See footnotes 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	Plant competition	Common trees	Site index	Productivity class*	
4220**:										
Nodaway	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Eastern white pine, red pine, black walnut, sugar maple, European larch.
Urban land.										
4291**:										
Atterberry	4A	Slight	Slight	Slight	Slight	Moderate	White oak	70	4	Eastern white pine, red pine, Scotch pine, eastern redcedar.
							Northern red oak	70	4	
							Green ash	---	---	
							Bur oak	---	---	
Urban land.										

* Productivity class is the yield in cubic meters per hectare per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

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
11B*: Colo	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, blue spruce, white fir, northern whitecedar, Washington hawthorn.	Eastern white pine	Pin oak.
Ely	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
20C2, 20C3, 20D2, 20D3, Killduff	---	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.
24D3, 24E2, 24E3--Shelby	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern whitecedar, blue spruce, white fir.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
41, 41B, 41C, 41D-Sparta	Siberian peashrub	Amur honeysuckle, lilac, eastern redcedar, radiant crabapple, Washington hawthorn, autumn olive.	Red pine, jack pine, Austrian pine.	Eastern white pine	---
54--Zook	---	Silky dogwood, Amur honeysuckle, American cranberrybush, Amur privet.	Norway spruce, northern whitecedar, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
63C, 63E--Chelsea	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn olive, Amur honeysuckle, lilac.	Austrian pine, jack pine, red pine.	Eastern white pine	---

See footnote at end of table.

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
65E2, 65F, 65G---- 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.
83B, 83C2, 83D2, 83D3---------- Kenyon	---	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	White fir, northern whitecedar, Washington hawthorn, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
84---------- Clyde	---	American cranberrybush, Amur privet, silky dogwood, Amur honeysuckle.	White fir, blue spruce, northern whitecedar, Washington hawthorn, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
118---------- Garwin	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	White fir, blue spruce, Norway spruce, northern whitecedar, Washington hawthorn, Austrian pine.	Eastern white pine	Pin oak.
119, 119B--------- Muscatine	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
120B, 120B2, 120C, 120C2, 120C3, 120D2, 120D3, 120E2, 120E3----- Tama	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
133---------- Colo	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, blue spruce, white fir, northern whitecedar, Washington hawthorn.	Eastern white pine	Pin oak.

See footnote at end of table.

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
139---------- Perks	---	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.
151---------- Marshan	---	Common ninebark, redosier dogwood, silky dogwood, nannyberry viburnum, American cranberrybush, northern whitecedar.	Balsam fir, white spruce.	Green ash, white ash, red maple, silver maple.	---
160---------- Walford	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
162B, 162C2, 162C3, 162D2, 162D3, 162E2, 162E3, 162F2----- Downs	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
163B2, 163C, 163C2, 163C3, 163D, 163D2, 163D3, 163E, 163E2, 163E3, 163F, 163F2, 163F3, 163G------ Fayette	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
174---------- Bolan	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn olive, Amur honeysuckle, lilac.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---

See footnote at end of table.

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
175, 175B, 175C--- Dickinson	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn olive, Amur honeysuckle, lilac.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
179D2, 179E2, 179E3, 179F2, 179F3---------- Gara	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Northern whitecedar, white fir, Washington hawthorn, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
184---------- Klinger	---	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	Northern whitecedar, white fir, Washington hawthorn, blue spruce, Austrian pine.	Norway spruce-----	Pin oak, eastern white pine.
220. Nodaway					
225---------- Lawler	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
254---------- Zook	---	Silky dogwood, Amur honeysuckle, American cranberrybush, Amur privet.	Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
273C---------- Olmitz	---	Amur honeysuckle, Amur privet, silky dogwood, American cranberrybush.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
284---------- Flagler	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn olive, Amur honeysuckle, lilac.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---

See footnote at end of table.

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
291---------- Atterberry	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
293C*, 293E*, 293F*: Chelsea---------	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn olive, Amur honeysuckle, lilac.	Austrian pine, jack pine, red pine.	Eastern white pine	---
Lamont----------	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush.	Austrian pine, eastern redcedar, northern whitecedar, Osage-orange.	Eastern white pine, Norway spruce, red pine.	---
Fayette---------	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
313G---------- Gosport	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osage-orange.	Eastern white pine, pin oak.	---
352B, 352C2------- Whittier	Siberian peashrub	Lilac, Amur honeysuckle, autumn olive, Washington hawthorn, radiant crabapple, eastern redcedar.	Eastern white pine, jack pine, red pine, Austrian pine.	---	---
354*. Aquolls					
377B, 377C, 377C2- Dinsdale	---	Amur honeysuckle, American cranberrybush, silky dogwood, Amur privet.	Northern whitecedar, white fir, Washington hawthorn, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.

See footnote at end of table.

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
382---------- Maxfield	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Blue spruce, Norway spruce, Austrian pine, white fir, northern whitecedar, Washington hawthorn.	Eastern white pine	Pin oak.
420B---------- Tama	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
426B, 426C, 426C2, 426D2---------- Aredale	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
428B---------- Ely	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
430, 430B--------- Ackmore	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
442C2*, 442D2*, 442E2*: Tama----------	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Dickinson-------	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn olive, Amur honeysuckle, lilac.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
450B, 450C2------- Pillot	Siberian peashrub	Amur honeysuckle, lilac, silky dogwood, eastern redcedar, radiant crabapple, Washington hawthorn, autumn olive.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---

See footnote at end of table.

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
484---------- Lawson	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
499G. Nordness					
539---------- Perks	---	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.
673D3, 673E3, 673F3---------- Timula	---	Osage-orange, Russian-olive, eastern redcedar, Washington hawthorn.	Honeylocust, northern catalpa, green ash.	---	---
763E3, 763F3------ Exette	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
767E3, 767F3------ Mula	---	Osage-orange, Russian-olive, eastern redcedar, Washington hawthorn.	Honeylocust, northern catalpa, green ash.	---	---
814---------- Rockton	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn olive, Amur honeysuckle, lilac, silky dogwood.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
820, 820B--------- Dockery	Fragrant sumac----	American plum, silky dogwood, blackhaw.	Washington hawthorn, nannyberry viburnum, white fir.	Green ash, eastern white pine, Norway spruce.	Pin oak, eastern cottonwood.
826---------- Rowley	---	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.

See footnote at end of table.

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
916B, 916C2, 916D2---------- Downs	Gray dogwood, silky dogwood.	Redosier dogwood, American plum.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, hackberry.	Silver maple, eastern cottonwood.
920B, 920C2, 920D2. Tama					
926. Canoe					
950, 950B--------- Niota	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
960---------- Shaffton	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	White fir, blue spruce, Austrian pine, northern whitecedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
961---------- Ambraw	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
977. Richwood					
1118---------- Garwin	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	White fir, blue spruce, Norway spruce, northern whitecedar, Washington hawthorn, Austrian pine.	Eastern white pine	Pin oak.
1119---------- Muscatine	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
1539*: Ambraw----------	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.

See footnote at end of table.

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
1539*:					
Perks.					
Lawson	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
1730B*:					
Nodaway	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Perks.					
4000*.					
Urban land					
4133*:					
Colo	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, blue spruce, white fir, northern whitecedar, Washington hawthorn.	Eastern white pine	Pin oak.
Urban land.					
4162C*, 4162D*:					
Downs	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Urban land.					
4163E*:					
Fayette	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Urban land.					

See footnote at end of table.

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
4220*:					
Nodaway	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Urban land.					
4291*:					
Atterberry	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Urban land.					
4977B*:					
Richwood.					
Urban land.					
5010*, 5030*.					
Pits					
5040*.					
Orthents, loamy					
5080*.					
Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

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
11B*:					
Colo	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
Ely	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
20C2 Killduff	Slight	Slight	Severe: slope.	Slight	Slight.
20C3 Killduff	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
20D2 Killduff	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
20D3 Killduff	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
24D3 Shelby	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
24E2 Shelby	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
24E3 Shelby	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
41 Sparta	Moderate: too sandy.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
41B Sparta	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Moderate: droughty.
41C Sparta	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty.
41D Sparta	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
54 Zook	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
63C Chelsea	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty.
63E Chelsea	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
65E2, 65F Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
65G Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
83B Kenyon	Slight	Slight	Moderate: slope.	Slight	Slight.
83C2 Kenyon	Slight	Slight	Severe: slope.	Slight	Slight.
83D2, 83D3 Kenyon	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
84 Clyde	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
118 Garwin	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
119 Muscatine	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
119B Muscatine	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
120B, 120B2 Tama	Slight	Slight	Moderate: slope.	Slight	Slight.
120C, 120C2 Tama	Slight	Slight	Severe: slope.	Slight	Slight.
120C3 Tama	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
120D2 Tama	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
120D3 Tama	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
120E2 Tama	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
120E3 Tama	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
133 Colo	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
139 Perks	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
151 Marshan	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
160--Walford	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
162B--Downs	Slight	Slight	Moderate: slope.	Slight	Slight.
162C2--Downs	Slight	Slight	Severe: slope.	Slight	Slight.
162C3--Downs	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
162D2--Downs	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
162D3--Downs	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
162E2--Downs	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
162E3--Downs	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
162F2--Downs	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
163B2--Fayette	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
163C--Fayette	Slight	Slight	Severe: slope.	Slight	Slight.
163C2, 163C3--Fayette	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
163D--Fayette	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
163D2, 163D3--Fayette	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
163E--Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
163E2, 163E3--Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
163F--Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
163F2, 163F3--Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
163G--Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
174--Bolan	Slight	Slight	Slight	Slight	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
175--Dickinson	Slight	Slight	Slight	Slight	Slight.
175B--Dickinson	Slight	Slight	Moderate: slope.	Slight	Slight.
175C--Dickinson	Slight	Slight	Severe: slope.	Slight	Slight.
179D2--Gara	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
179E2--Gara	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
179E3--Gara	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
179F2--Gara	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
179F3--Gara	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
184--Klinger	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
220--Nodaway	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
225--Lawler	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
254--Zook	Severe: flooding, wetness, too clayey.	Severe: too clayey.	Severe: too clayey, wetness.	Severe: too clayey.	Severe: too clayey.
273C--Olmitz	Slight	Slight	Severe: slope.	Slight	Slight.
284--Flagler	Slight	Slight	Slight	Slight	Slight.
291--Atterberry	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
293C*:					
Chelsea	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
Lamont	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
293E*:					
Chelsea	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
Lamont	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Fayette	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
293F*:					
Chelsea	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
Lamont	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
313G Gosport	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, erodes easily.	Severe: slope.
352B Whittier	Slight	Slight	Moderate: slope.	Slight	Slight.
352C2 Whittier	Slight	Slight	Severe: slope.	Slight	Slight.
354* Aquolls	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
377B Dinsdale	Slight	Slight	Moderate: slope.	Slight	Slight.
377C, 377C2 Dinsdale	Slight	Slight	Severe: slope.	Slight	Slight.
382 Maxfield	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
420B Tama	Slight	Slight	Moderate: slope.	Slight	Slight.
426B Aredale	Slight	Slight	Moderate: slope.	Slight	Slight.
426C, 426C2 Aredale	Slight	Slight	Severe: slope.	Slight	Slight.
426D2 Aredale	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
428B Ely	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
430, 430B---------- Ackmore	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
442C2*:					
Tama----------	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
Dickinson----------	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
442D2*, 442E2*:					
Tama----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
Dickinson----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
450B---------- Pillot	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
450C2---------- Pillot	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
484---------- Lawson	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
499G---------- Nordness	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
539---------- Perks	Severe: flooding.	Slight----------	Slight----------	Slight----------	Severe: droughty.
673D3---------- Timula	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
673E3, 673F3---------- Timula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
763E3, 763F3---------- Exette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
767E3, 767F3---------- Mula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
814---------- Rockton	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: depth to rock.
820---------- Dockery	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Slight----------	Moderate: flooding.
820B---------- Dockery	Severe: flooding.	Moderate: wetness.	Moderate: slope, wetness, flooding.	Slight----------	Moderate: flooding.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
826 Rowley	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
916B Downs	Slight	Slight	Moderate: slope.	Slight	Slight.
916C2 Downs	Slight	Slight	Severe: slope.	Slight	Slight.
916D2 Downs	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
920B Tama	Slight	Slight	Moderate: slope.	Slight	Slight.
920C2 Tama	Slight	Slight	Severe: slope.	Slight	Slight.
920D2 Tama	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
926 Canoe	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
950, 950B Niota	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, erodes easily.	Severe: ponding.
960 Shaffton	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Slight	Moderate: flooding.
961 Ambraw	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
977 Richwood	Slight	Slight	Slight	Slight	Slight.
1118 Garwin	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
1119 Muscatine	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
1539*: Ambraw	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Perks	Severe: flooding.	Moderate: flooding.	Slight	Moderate: flooding.	Severe: droughty, flooding.
Lawson	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1730B*:					
Nodaway	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Perks	Severe: flooding.	Moderate: flooding.	Moderate: slope.	Moderate: flooding.	Severe: droughty, flooding.
4000*. Urban land					
4133*:					
Colo	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
Urban land.					
4162C*:					
Downs	Slight	Slight	Moderate: slope.	Slight	Slight.
Urban land.					
4162D*:					
Downs	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Urban land.					
4163E*:					
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Urban land.					
4220*:					
Nodaway	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Urban land.					
4291*:					
Atterberry	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
4977B*:					
Richwood	Slight	Slight	Moderate: slope.	Slight	Slight.
Urban land.					
5010*, 5030*. Pits					
5040* Orthents, loamy	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope.	Slight	Slight.
5080*. Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

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
11B*:										
Colo	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
Ely	Good	Good	Good	Good	Good	Fair	Very poor.	Good	Good	Poor.
20C2, 20C3--------- Killduff	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
20D2, 20D3--------- Killduff	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
24D3---------- Shelby	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
24E2, 24E3--------- Shelby	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
41, 41B---------- Sparta	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
41C, 41D---------- Sparta	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
54---------- Zook	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
63C---------- Chelsea	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
63E---------- Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
65E2, 65F---------- Lindley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
65G---------- Lindley	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
83B---------- Kenyon	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
83C2, 83D2, 83D3--- Kenyon	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
84---------- Clyde	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
118---------- Garwin	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
119, 119B---------- Muscatine	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
120B, 120B2-------- Tama	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

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
120C, 120C2, 120C3, 120D2, 120D3, 120E2, 120E3---Tama	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
133---Colo	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
139---Perks	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
151---Marshan	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
160---Walford	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
162B---Downs	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
162C2, 162C3, 162D2, 162D3---Downs	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
162E2, 162E3, 162F2---Downs	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
163B2---Fayette	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
163C---Fayette	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
163C2, 163C3---Fayette	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
163D---Fayette	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
163D2, 163D3---Fayette	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
163E, 163E2, 163E3, 163F, 163F2, 163F3---Fayette	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
163G---Fayette	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
174---Bolan	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
175, 175B---Dickinson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
175C---Dickinson	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

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
179D2---------- Gara	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Poor.
179E2, 179E3, 179F2, 179F3------ Gara	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
184---------- Klinger	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
220---------- Nodaway	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
225---------- Lawler	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
254---------- Zook	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
273C---------- Olmitz	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
284---------- Flagler	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
291---------- Atterberry	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
293C*: Chelsea----------	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Lamont---------- Fayette.	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
293E*: Chelsea----------	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Lamont----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Fayette----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
293F*: Chelsea----------	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Lamont---------- Fayette.	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
313G---------- Gosport	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.

See footnote at end of table.

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
352B, 352C2--------- Whittier	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
354*. Aquolls										
377B---------- Dinsdale	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
377C, 377C2--------- Dinsdale	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
382---------- Maxfield	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
420B---------- Tama	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
426B---------- Aredale	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
426C, 426C2, 426D2- Aredale	Fair	Good	Good	Good	Good	Very poor.	Poor	Good	Good	Poor.
428B---------- Ely	Good	Good	Good	Good	Good	Fair	Very poor.	Good	Good	Poor.
430, 430B---------- Ackmore	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
442C2*, 442D2*, 442E2*: Tama----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Dickinson---------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
450B---------- Pillot	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
450C2---------- Pillot	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
484---------- Lawson	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
499G---------- Nordness	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
539---------- Perks	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
673D3---------- Timula	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
673E3, 673F3------- Timula	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

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
763E3, 763F3--- Exette	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
767E3, 767F3--- Mula	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
814--- Rockton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
820, 820B--- Dockery	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
826--- Rowley	Good	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
916B--- Downs	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
916C2, 916D2--- Downs	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
920B, 920C2, 920D2- Tama	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
926--- Canoe	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
950, 950B--- Niota	Poor	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
960--- Shaffton	Good	Good	Good	Good	Fair	Good	Good	Good	Good	Good.
961--- Ambraw	Good	Fair	Good	Good	Fair	Good	Good	Good	Good	Good.
977--- Richwood	Good	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
1118--- Garwin	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
1119--- Muscatine	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
1539*:										
Ambraw---	Good	Fair	Good	Good	Fair	Good	Good	Good	Good	Good.
Perks---	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Poor	Very poor.
Lawson---	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
1730B*:										
Nodaway---	Poor	Fair	Fair	Poor	Poor	Good	Fair	Poor	Poor	Fair.
Perks---	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Poor	Very poor.

See footnote at end of table.

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
4000*. Urban land										
4133*: Colo	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
Urban land.										
4162C*, 4162D*: Downs	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
4163E*: Fayette	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Urban land.										
4220*: Nodaway	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
Urban land.										
4291*: Atterberry	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.										
4977B*: Richwood	Good	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
Urban land.										
5010*, 5030*. Pits										
5040*. Orthents, loamy										
5080*. Orthents										

* See description of the map unit for composition and behavior characteristics of the map unit.

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
11B*: Colo	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
Ely	Severe: excess humus, wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
20C2, 20C3: Killduff	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
20D2, 20D3: Killduff	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
24D3: Shelby	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
24E2, 24E3: Shelby	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
41, 41B: Sparta	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
41C: Sparta	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
41D: Sparta	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
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.
63C: Chelsea	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
63E: Chelsea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
65E2, 65F, 65G: Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
83B: Kenyon	Slight	Slight	Slight	Slight	Moderate: low strength, frost action.	Slight.

See footnote at end of table.

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
83C2---------- Kenyon	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength, frost action.	Slight.
83D2, 83D3-------- Kenyon	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
84---------- Clyde	Severe: excess humus, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
118---------- Garwin	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
119, 119B--------- Muscatine	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
120B, 120B2------- Tama	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
120C, 120C2, 120C3---------- Tama	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
120D2, 120D3------ Tama	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
120E2, 120E3------ Tama	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
133---------- Colo	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
139---------- Perks	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty.
151---------- Marshan	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
160---------- Walford	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
162B---------- Downs	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.

See footnote at end of table.

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
162C2, 162C3---Downs	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
162D2, 162D3---Downs	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
162E2, 162E3, 162F2---Downs	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
163B2---Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
163C, 163C2, 163C3---Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
163D, 163D2, 163D3---Fayette	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
163E, 163E2, 163E3, 163F, 163F2, 163F3, 163G---Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
174---Bolan	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
175, 175B---Dickinson	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
175C---Dickinson	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
179D2---Gara	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
179E2, 179E3, 179F2, 179F3---Gara	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
184---Klinger	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.

See footnote at end of table.

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
220--- Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
225--- Lawler	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Slight.
254--- Zook	Severe: cutbanks cave, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: too clayey.
273C--- Olmitz	Slight---	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
284--- Flagler	Severe: cutbanks cave.	Slight---	Slight---	Slight---	Slight---	Slight.
291--- Atterberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
293C*:						
Chelsea---	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lamont---	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Fayette---	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
293E*:						
Chelsea---	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Lamont---	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Fayette---	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
293F*:						
Chelsea---	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lamont---	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

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
293F*: Fayette	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
313G---------- Gosport	Severe: wetness, slope.	Severe: shrink-swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
352B---------- Whittier	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Severe: low strength.	Slight.
352C2---------- Whittier	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
354*---------- Aquolls	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
377B---------- Dinsdale	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
377C---------- Dinsdale	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
377C2---------- Dinsdale	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
382---------- Maxfield	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
420B---------- Tama	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
426B---------- Aredale	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: low strength, frost action.	Slight.
426C, 426C2------- Aredale	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength, frost action.	Slight.
426D2---------- Aredale	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
428B---------- Ely	Severe: excess humus, wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.

See footnote at end of table.

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
430, 430B--------- Ackmore	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
442C2*:						
Tama--------------	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Dickinson--------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
442D2*, 442E2*:						
Tama--------------	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Dickinson--------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
450B-------------- Pillot	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
450C2------------- Pillot	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
484--------------- Lawson	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
499G-------------- Nordness	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: slope, depth to rock.
539--------------- Perks	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty.
673D3------------- Timula	Moderate: cutbanks cave, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
673E3, 673F3------ Timula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
763E3, 763F3------ Exette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
767E3, 767F3------ Mula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.

See footnote at end of table.

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
814---------- Rockton	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Moderate: depth to rock.
820, 820B---------- Dockery	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
826---------- Rowley	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, frost action.	Moderate: wetness.
916B---------- Downs	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
916C2---------- Downs	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
916D2---------- Downs	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
920B---------- Tama	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
920C2---------- Tama	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
920D2---------- Tama	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
926---------- Canoe	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Slight.
950, 950B---------- Niota	Severe: cutbanks cave, ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
960---------- Shaffton	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
961---------- Ambraw	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
977---------- Richwood	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.

See footnote at end of table.

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
1118--- Garwin	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
1119--- Muscatine	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
1539*:						
Ambraw---	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Perks---	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty, flooding.
Lawson---	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
1730B*:						
Nodaway---	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Severe: flooding.
Perks---	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty, flooding.
4000*. Urban land						
4133*:						
Colo---	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
Urban land.						
4162C*:						
Downs---	Slight---	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Urban land.						
4162D*:						
Downs---	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Urban land.						

See footnote at end of table.

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
4163E*:						
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Urban land.						
4220*:						
Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
Urban land.						
4291*:						
Atterberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Urban land.						
4977B*:						
Richwood	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
Urban land.						
5010*, 5030*. Pits						
5040* Orthents, loamy	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Slight.
5080*. Orthents						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "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	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
11B*:					
Colo	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Ely	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
20C2 Killduff	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
20C3 Killduff	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
20D2 Killduff	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
20D3 Killduff	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
24D3 Shelby	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
24E2, 24E3 Shelby	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
41, 41B Sparta	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
41C, 41D Sparta	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
54 Zook	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
63C, 63E Chelsea	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
65E2, 65F, 65G Lindley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
83B Kenyon	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.

See footnote at end of table.

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
83C2---------- Kenyon	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
83D2, 83D3---------- Kenyon	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
84---------- Clyde	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
118---------- Garwin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
119, 119B---------- Muscatine	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
120B, 120B2--------- Tama	Slight----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
120C, 120C2, 120C3-- Tama	Slight----------	Severe: slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
120D2, 120D3-------- Tama	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
120E2, 120E3-------- Tama	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
133---------- Colo	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
139---------- Perks	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
151---------- Marshan	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
160---------- Walford	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
162B---------- Downs	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
162C2, 162C3-------- Downs	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
162D2, 162D3-------- Downs	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.

See footnote at end of table.

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
162E2, 162E3, 162F2--Downs	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
163B2--Fayette	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
163C, 163C2, 163C3--Fayette	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
163D, 163D2, 163D3--Fayette	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
163E, 163E2, 163E3, 163F, 163F2, 163F3, 163G--Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
174--Bolan	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
175, 175B--Dickinson	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
175C--Dickinson	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
179D2--Gara	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
179E2, 179E3, 179F2, 179F3--Gara	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
184--Klinger	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
220--Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
225--Lawler	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
254--Zook	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
273C--Olmitz	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.

See footnote at end of table.

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
284---------- Flagler	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
291---------- Atterberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
293C*:					
Chelsea----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Lamont----------	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Fayette----------	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
293E*:					
Chelsea----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Lamont----------	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope, thin layer.
Fayette----------	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: too clayey, slope, thin layer.
293F*:					
Chelsea----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Lamont----------	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Fayette----------	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
313G---------- Gosport	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
352B---------- Whittier	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

See footnote at end of table.

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
352C2---------- Whittier	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
354*---------- Aquolls	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
377B---------- Dinsdale	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
377C, 377C2--------- Dinsdale	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
382---------- Maxfield	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
420B---------- Tama	Slight----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
426B---------- Aredale	Slight----------	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Fair: too sandy.
426C---------- Aredale	Slight----------	Severe: seepage, slope.	Moderate: too sandy.	Severe: seepage.	Fair: too sandy.
426C2---------- Aredale	Slight----------	Severe: seepage, slope.	Moderate: too clayey.	Severe: seepage.	Fair: too clayey.
426D2---------- Aredale	Moderate: slope.	Severe: seepage, slope.	Moderate: slope, too clayey.	Severe: seepage.	Fair: too clayey, slope.
428B---------- Ely	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
430, 430B---------- Ackmore	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
442C2*:					
Tama----------	Slight----------	Severe: seepage, slope.	Severe: seepage.	Slight----------	Fair: too clayey, thin layer.
Dickinson----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
442D2*, 442E2*:					
Tama----------	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: too clayey, slope, thin layer.

See footnote at end of table.

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
442D2*, 442E2*: Dickinson	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
450B Pillot	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
450C2 Pillot	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
484 Lawson	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
499G Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
539 Perks	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
673D3 Timula	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
673E3, 673F3 Timula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
763E3, 763F3 Exette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
767E3, 767F3 Mula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
814 Rockton	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
820, 820B Dockery	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
826 Rowley	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
916B Downs	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey, thin layer.
916C2 Downs	Moderate: percs slowly.	Severe: seepage, slope.	Severe: seepage.	Slight	Fair: too clayey, thin layer.

See footnote at end of table.

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
916D2---------- Downs	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: too clayey, slope, thin layer.
920B---------- Tama	Slight----------	Severe: seepage.	Severe: seepage.	Slight----------	Fair: too clayey, thin layer.
920C2---------- Tama	Slight----------	Severe: seepage, slope.	Severe: seepage.	Slight----------	Fair: too clayey, thin layer.
920D2---------- Tama	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: too clayey, slope, thin layer.
926---------- Canoe	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
950, 950B---------- Niota	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
960---------- Shaffton	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: thin layer.
961---------- Ambraw	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
977---------- Richwood	Slight----------	Severe: seepage.	Severe: seepage.	Slight----------	Fair: too clayey, thin layer.
1118---------- Garwin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
1119---------- Muscatine	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
1539*:					
Ambraw----------	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Perks----------	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.

See footnote at end of table.

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
1539*:					
Lawson	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
1730B*:					
Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Perks	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
4000*.					
Urban land					
4133*:					
Colo	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Urban land.					
4162C*:					
Downs	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Urban land.					
4162D*:					
Downs	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Urban land.					
4163E*:					
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Urban land.					
4220*:					
Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Urban land.					
4291*:					
Atterberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Urban land.					

See footnote at end of table.

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
4977B*: Richwood	Slight	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey, thin layer.
Urban land.					
5010*, 5030*. Pits					
5040* Orthents, loamy	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
5080*. Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

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
11B*:				
Colo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ely	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
20C2, 20C3 Killduff	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
20D2, 20D3 Killduff	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
24D3 Shelby	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
24E2, 24E3 Shelby	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
41, 41B, 41C, 41D Sparta	Good	Probable	Improbable: too sandy.	Poor: too sandy.
54 Zook	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
63C, 63E Chelsea	Good	Probable	Improbable: too sandy.	Poor: too sandy.
65E2, 65F Lindley	Fair: shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
65G Lindley	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
83B Kenyon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
83C2 Kenyon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
83D2, 83D3 Kenyon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
84 Clyde	Fair: shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
118--Garwin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
119, 119B--Muscatine	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
120B--Tama	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
120B2--Tama	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
120C--Tama	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
120C2, 120C3--Tama	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
120D2, 120D3--Tama	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
120E2, 120E3--Tama	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
133--Colo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
139--Perks	Good	Probable	Improbable: too sandy.	Poor: too sandy.
151--Marshan	Poor: wetness.	Probable	Probable	Poor: area reclaim, wetness.
160--Walford	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
162B, 162C2, 162C3--Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
162D2, 162D3--Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
162E2, 162E3, 162F2--Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
163B2, 163C, 163C2, 163C3--Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
163D, 163D2, 163D3--Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
163E, 163E2, 163E3, 163F, 163F2, 163F3--Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
163G---------- Fayette	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
174---------- Bolan	Good----------	Probable----------	Improbable: too sandy.	Fair: thin layer.
175, 175B, 175C------- Dickinson	Good----------	Probable----------	Improbable: too sandy.	Fair: thin layer.
179D2---------- Gara	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
179E2, 179E3, 179F2, 179F3---------- Gara	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
184---------- Klinger	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
220---------- Nodaway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
225---------- Lawler	Fair: wetness.	Probable----------	Probable----------	Poor: area reclaim.
254---------- Zook	Fair: wetness.	Probable----------	Improbable: too sandy.	Poor: too clayey.
273C---------- Olmitz	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
284---------- Flagler	Good----------	Probable----------	Probable----------	Fair: small stones, area reclaim, thin layer.
291---------- Atterberry	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
293C*:				
Chelsea----------	Fair: slope.	Probable----------	Improbable: too sandy.	Poor: too sandy, slope.
Lamont----------	Fair: slope.	Probable----------	Improbable: too sandy.	Poor: slope.
Fayette----------	Fair: slope.	Probable----------	Improbable: too sandy.	Poor: slope.
293E*:				
Chelsea----------	Good----------	Probable----------	Improbable: too sandy.	Poor: too sandy.
Lamont----------	Good----------	Probable----------	Improbable: too sandy.	Fair: too clayey, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
293E*: Fayette	Good	Probable	Improbable: too sandy.	Fair: too clayey, slope.
293F*: Chelsea	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Lamont	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
Fayette	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
313G Gosport	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
352B, 352C2 Whittier	Good	Probable	Improbable: too sandy.	Fair: too clayey, thin layer.
354* Aquolls	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
377B, 377C Dinsdale	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
377C2 Dinsdale	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
382 Maxfield	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
420B Tama	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
426B, 426C Aredale	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
426C2 Aredale	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
426D2 Aredale	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
428B Ely	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
430, 430B Ackmore	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
442C2*: Tama	Good	Probable	Improbable: too sandy.	Fair: too clayey.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
442C2*: Dickinson	Good	Probable	Improbable: too sandy.	Fair: thin layer.
442D2*, 442E2*: Tama	Good	Probable	Improbable: too sandy.	Fair: too clayey, slope.
Dickinson	Good	Probable	Improbable: too sandy.	Fair: thin layer, slope.
450B, 450C2 Pillot	Good	Probable	Improbable: too sandy.	Fair: area reclaim, small stones.
484 Lawson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
499G Nordness	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
539 Perks	Good	Probable	Improbable: too sandy.	Poor: too sandy.
673D3 Timula	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
673E3, 673F3 Timula	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
763E3, 763F3 Exette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
767E3, 767F3 Mula	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
814 Rockton	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones.
820, 820B Dockery	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
826 Rowley	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too clayey.
916B, 916C2 Downs	Good	Probable	Improbable: too sandy.	Fair: too clayey.
916D2 Downs	Good	Probable	Improbable: too sandy.	Fair: too clayey, slope.
920B Tama	Good	Probable	Improbable: too sandy.	Good.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
920C2---------- Tama	Good----------	Probable----------	Improbable: too sandy.	Fair: too clayey.
920D2---------- Tama	Good----------	Probable----------	Improbable: too sandy.	Fair: too clayey, slope.
926---------- Canoe	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
950, 950B---------- Niota	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
960---------- Shaffton	Fair: wetness.	Probable----------	Improbable: too sandy.	Good.
961---------- Ambraw	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
977---------- Richwood	Good----------	Probable----------	Improbable: too sandy.	Good.
1118---------- Garwin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1119---------- Muscatine	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1539*: Ambraw----------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Perks----------	Good----------	Probable----------	Improbable: too sandy.	Poor: too sandy.
Lawson----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1730B*: Nodaway----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Perks----------	Good----------	Probable----------	Improbable: too sandy.	Poor: too sandy.
4000*. Urban land				
4133*: Colo----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
4162C*: Downs----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
4162C*: Urban land.				
4162D*: Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Urban land.				
4163E*: Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Urban land.				
4220*: Nodaway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Urban land.				
4291*: Atterberry	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Urban land.				
4977B*: Richwood	Good	Probable	Improbable: too sandy.	Good.
Urban land.				
5010*, 5030*. Pits				
5040* Orthents, loamy	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
5080*. Orthents				

* See description of the map unit for composition and behavior characteristics of the map unit.

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	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
11B*:						
Colo	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness	Wetness.
Ely	Moderate: seepage, slope.	Moderate: piping, wetness.	Moderate: deep to water, slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
20C2, 20C3 Killduff	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
20D2, 20D3 Killduff	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
24D3 Shelby	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
24E2 Shelby	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope.
24E3 Shelby	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
41, 41B, 41C Sparta	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
41D Sparta	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
54 Zook	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
63C Chelsea	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
63E Chelsea	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
65E2, 65F, 65G Lindley	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope.
83B, 83C2 Kenyon	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Favorable	Favorable.
83D2, 83D3 Kenyon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
84---------- Clyde	Severe: seepage.	Severe: thin layer, wetness.	Moderate: slow refill.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
118---------- Garwin	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action---	Wetness--------	Wetness.
119---------- Muscatine	Moderate: seepage.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action---	Erodes easily, wetness.	Erodes easily.
119B---------- Muscatine	Moderate: seepage, slope.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
120B, 120B2, 120C, 120C2, 120C3----- Tama	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
120D2, 120D3, 120E2, 120E3----- Tama	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
133---------- Colo	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness--------	Wetness.
139---------- Perks	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty, rooting depth.
151---------- Marshan	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, too sandy.	Wetness.
160---------- Walford	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
162B, 162C2, 162C3---------- Downs	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
162D2, 162D3, 162E2, 162E3, 162F2---------- Downs	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
163B2, 163C, 163C2, 163C3----- Fayette	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
163D, 163D2, 163D3, 163E, 163E2, 163E3, 163F, 163F2, 163F3, 163G------ Fayette	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
174---------- Bolan	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy------	Favorable.
175, 175B, 175C--- Dickinson	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Favorable.
179D2, 179E2------ Gara	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope----------	Slope, rooting depth.
179E3---------- Gara	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.
179F2---------- Gara	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope----------	Slope, rooting depth.
179F3---------- Gara	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.
184---------- Klinger	Moderate: seepage.	Moderate: piping, wetness.	Moderate: deep to water, slow refill.	Frost action---	Erodes easily, wetness.	Erodes easily, rooting depth.
220---------- Nodaway	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Erodes easily	Erodes easily.
225---------- Lawler	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, too sandy.	Rooting depth.
254---------- Zook	Severe: seepage.	Severe: hard to pack, wetness.	Severe: slow refill, cutbanks cave.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Wetness, percs slowly.
273C---------- Olmitz	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Favorable------	Favorable.
284---------- Flagler	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Rooting depth.
291---------- Atterberry	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
293C*, 293E*, 293F*:						
Chelsea---------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
Lamont----------	Severe: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope.
Fayette---------	Severe: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
313G---------- Gosport	Severe: slope.	Slight---------	Severe: no water.	Percs slowly, depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
352B, 352C2------- Whittier	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Erodes easily, too sandy.	Erodes easily.
354*---------- Aquolls	Slight---------	Severe: ponding.	Slight---------	Ponding--------	Ponding--------	Wetness.
377B, 377C-------- Dinsdale	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily, rooting depth.
377C2---------- Dinsdale	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Erodes easily	Erodes easily, rooting depth.
382---------- Maxfield	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action---	Wetness--------	Wetness, rooting depth.
420B---------- Tama	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
426B, 426C-------- Aredale	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Too sandy------	Favorable.
426C2---------- Aredale	Severe: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Favorable------	Favorable.
426D2---------- Aredale	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope----------	Slope.
428B---------- Ely	Moderate: seepage, slope.	Moderate: piping, wetness.	Moderate: deep to water, slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
430---------- Ackmore	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness--------	Wetness.
430B---------- Ackmore	Moderate: seepage, slope.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action, slope.	Wetness--------	Wetness.
442C2*:						
Tama----------	Severe: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Dickinson--------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Favorable.
442D2*, 442E2*:						
Tama----------	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
442D2*, 442E2*: Dickinson	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope.
450B, 450C2 Pillot	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Erodes easily, too sandy.	Erodes easily.
484 Lawson	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
499G Nordness	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
539 Perks	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty, rooting depth.
673D3, 673E3, 673F3 Timula	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
763E3, 763F3 Exette	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
767E3, 767F3 Mula	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
814 Rockton	Moderate: seepage, depth to rock.	Severe: thin layer.	Severe: no water.	Deep to water	Depth to rock	Depth to rock.
820 Dockery	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Flooding, frost action.	Erodes easily, wetness.	Erodes easily.
820B Dockery	Moderate: seepage, slope.	Severe: piping.	Moderate: deep to water, slow refill.	Flooding, frost action, slope.	Erodes easily, wetness.	Erodes easily.
826 Rowley	Severe: seepage.	Severe: wetness.	Severe: cutbanks cave.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
916B, 916C2 Downs	Severe: seepage.	Moderate: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
916D2 Downs	Severe: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
920B, 920C2 Tama	Severe: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
920D2 Tama	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
926---------- Canoe	Moderate: seepage.	Moderate: piping, wetness.	Moderate: deep to water, slow refill.	Frost action---	Erodes easily, wetness.	Erodes easily.
950---------- Niota	Moderate: seepage.	Severe: hard to pack, ponding.	Severe: no water.	Ponding, percs slowly.	Erodes easily, ponding.	Wetness, erodes easily.
950B---------- Niota	Moderate: seepage, slope.	Severe: hard to pack, ponding.	Severe: no water.	Ponding, percs slowly.	Erodes easily, ponding.	Wetness, erodes easily.
960---------- Shaffton	Severe: seepage.	Severe: piping.	Severe: cutbanks cave.	Flooding-------	Erodes easily, wetness.	Erodes easily.
961---------- Ambraw	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
977---------- Richwood	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
1118---------- Garwin	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action---	Wetness--------	Wetness.
1119---------- Muscatine	Moderate: seepage.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action---	Erodes easily, wetness.	Erodes easily.
1539*:						
Ambraw----------	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Perks----------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty, rooting depth.
Lawson----------	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
1730B*:						
Nodaway----------	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Erodes easily	Erodes easily.
Perks----------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty, rooting depth.
4000*. Urban land						
4133*:						
Colo----------	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness--------	Wetness.
Urban land.						

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
4162C*:						
Downs	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Urban land.						
4162D*:						
Downs	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Urban land.						
4163E*:						
Fayette	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Urban land.						
4220*:						
Nodaway	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Erodes easily	Erodes easily.
Urban land.						
4291*:						
Atterberry	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
Urban land.						
4977B*:						
Richwood	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Urban land.						
5010*, 5030*. Pits						
5040*. Orthents, loamy	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Favorable	Favorable.
5080*. Orthents						

* See description of the map unit for composition and behavior characteristics of the map unit.

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		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
11B*:											
Colo	0-11	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-60	15-30
	11-31	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-55	20-30
	31-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	80-100	40-55	15-30
Ely	0-29	Silty clay loam	CL, OL, OH, MH	A-7, A-6	0	100	100	95-100	95-100	30-55	10-25
	29-51	Silty clay loam	CL, ML	A-7, A-6	0	100	100	95-100	95-100	35-50	10-25
	51-60	Silt loam, silty clay loam, loam.	CL	A-6	0	100	100	90-100	85-100	25-40	10-20
20C2, 20C3, 20D2, 20D3	0-7	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	35-50	15-25
Killduff	7-19	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	19-60	Silt loam, silty clay loam.	CL	A-6	0	100	100	100	95-100	30-40	10-20
24D3	0-6	Clay loam	CL	A-6, A-7	0	90-95	85-95	75-90	55-70	35-45	15-25
Shelby	6-47	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
	47-60	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
24E2	0-6	Loam	CL	A-6, A-7	0	90-95	85-95	75-90	55-70	35-45	15-25
Shelby	6-47	Clay loam	CL	A-6, A-7	0	90-95	85-95	75-90	55-70	35-45	15-25
	47-60	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
24E3	0-6	Clay loam	CL	A-6, A-7	0	90-95	85-95	75-90	55-70	35-45	15-25
Shelby	6-47	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
	47-60	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
41, 41B, 41C, 41D	0-23	Loamy fine sand	SM	A-2, A-4	0	85-100	85-100	50-95	15-50	---	NP
Sparta	23-36	Loamy fine sand, fine sand, sand.	SP-SM, SM	A-2, A-3, A-4	0	85-100	85-100	50-95	5-50	---	NP
	36-60	Sand, fine sand	SP-SM, SM, SP	A-2, A-3	0	85-100	85-100	50-95	2-30	---	NP
54	0-8	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	45-65	20-35
Zook	8-45	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
	45-60	Silty clay loam, silty clay, silt loam.	CH, CL, ML, MH	A-7, A-6	0	100	100	95-100	95-100	35-80	10-50
63C, 63E	0-8	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-95	10-35	---	NP
Chelsea	8-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-95	3-15	---	NP
65E2, 65F, 65G	0-6	Loam	CL	A-6	0	95-100	90-100	85-95	50-65	25-35	10-15
Lindley	6-48	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	12-20
	48-60	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	50-70	25-35	10-15
83B, 83C2, 83D2	0-18	Loam	CL	A-6	0	100	95-100	85-95	65-75	30-40	10-20
Kenyon	18-60	Loam, clay loam, sandy clay loam.	CL	A-6	0-5	90-95	85-95	80-90	50-65	30-40	10-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
83D3----------	0-8	Loam----------	CL	A-6	0	100	95-100	85-95	65-75	30-40	10-20
Kenyon	8-42	Loam, clay loam, sandy clay loam.	CL	A-6	0-5	90-95	85-95	80-90	50-65	30-40	10-20
	42-60	Loam----------	CL	A-6	0-5	90-95	85-95	80-90	50-65	25-35	10-20
84----------	0-22	Clay loam--------	OL, MH, ML, OH	A-7	0-5	95-100	95-100	80-90	55-75	45-60	15-25
Clyde	22-42	Clay loam, loam, silty clay loam.	CL, ML	A-6, A-7	0-5	95-100	90-95	75-90	50-75	30-50	10-20
	42-48	Sandy loam, loam, sandy clay loam.	SM, SC-SM	A-2	2-5	80-95	75-90	50-80	15-35	15-20	NP-5
	48-60	Loam, sandy clay loam.	CL, SC	A-6	2-5	90-95	85-90	75-90	45-65	25-35	10-20
118----------	0-18	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	45-55	20-30
Garwin	18-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	45-55	25-35
119, 119B--------	0-15	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
Muscatine	15-47	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	20-30
	47-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
120B----------	0-19	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	19-60	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
120B2----------	0-7	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	7-19	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
	19-60	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
120C----------	0-17	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	17-60	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
120C2----------	0-7	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	7-19	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
	19-60	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
120C3----------	0-6	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	6-19	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	19-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
120D2----------	0-7	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	7-19	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
	19-60	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
120D3----------	0-6	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	6-19	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	19-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
120E2----------	0-7	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	7-19	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
	19-60	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
120E3----------	0-6	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	6-19	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	19-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
133----------	0-11	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-60	15-30
Colo	11-31	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-55	20-30
	31-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	80-100	40-55	15-30
139----------	0-4	Sand----------	SM, SP, SP-SM	A-1	0	90-100	90-95	30-50	3-20	---	NP
Perks	4-60	Sand, loamy sand	SM, SP, SP-SM	A-1	0	90-100	90-95	30-50	3-20	---	NP
151----------	0-9	Clay loam--------	CL	A-7, A-6	0	95-100	95-100	95-100	80-95	35-50	15-25
Marshan	9-28	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-6, A-4	0	95-100	75-100	70-90	45-75	25-40	5-15
	28-60	Coarse sand, gravelly coarse sand, sand.	SP, SW, SP-SM	A-1	0-3	65-95	45-95	20-45	2-5	---	NP
160----------	0-9	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-35	10-15
Walford	9-13	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	13-60	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	45-55	20-30
162B----------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Downs	8-60	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	35-45	15-25
162C2----------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Downs	8-60	Silty clay loam, silt loam.	CL	A-7, A-8	0	100	100	100	95-100	35-45	15-25
162C3----------	0-8	Silty clay loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
Downs	8-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
162D2----------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Downs	8-60	Silty clay loam, silt loam.	CL	A-7, A-8	0	100	100	100	95-100	35-45	15-25
162D3----------	0-8	Silty clay loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
Downs	8-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
162E2----------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Downs	8-60	Silty clay loam, silt loam.	CL	A-7, A-8	0	100	100	100	95-100	35-45	15-25
162E3----------	0-8	Silty clay loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
Downs	8-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
162F2----------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Downs	8-60	Silty clay loam, silt loam.	CL	A-7, A-8	0	100	100	100	95-100	35-45	15-25
163B2----------	0-6	Silt loam--------	CL	A-6, A-7	0	100	100	100	95-100	30-45	10-25
Fayette	6-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
163C----------	0-11	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Fayette	11-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
163C2	0-8	Silt loam	CL	A-6, A-7	0	100	100	100	95-100	30-45	10-25
Fayette	8-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
163C3	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
Fayette	8-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
163D	0-11	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Fayette	11-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
163D2	0-8	Silt loam	CL	A-6, A-7	0	100	100	100	95-100	30-45	10-25
Fayette	8-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
163D3	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
Fayette	8-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
163E	0-11	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Fayette	11-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
163E2	0-8	Silt loam	CL	A-6, A-7	0	100	100	100	95-100	30-45	10-25
Fayette	8-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
163E3	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
Fayette	8-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
163F	0-9	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Fayette	9-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
163F2	0-8	Silt loam	CL	A-6, A-7	0	100	100	100	95-100	30-45	10-25
Fayette	8-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
163F3	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
Fayette	8-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
163G	0-8	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Fayette	8-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
174	0-23	Loam	CL, ML	A-4, A-6	0	100	100	85-95	50-70	30-40	5-15
Bolan	23-39	Loam, fine sandy loam.	CL, SC, CL-ML, SC-SM	A-4, A-6	0	100	100	80-90	40-55	25-35	5-15
	39-48	Fine sandy loam, loamy fine sand.	SM, SC-SM, SC	A-4	0	100	100	80-90	35-50	15-25	2-8
	48-60	Loamy fine sand, fine sand, loamy sand.	SM, SP-SM	A-2	0	100	100	70-85	10-30	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
175, 175B, 175C--Dickinson	0-8	Fine sandy loam	SM, SC, SC-SM	A-4, A-2	0	100	100	85-95	30-50	15-30	NP-10
	8-26	Fine sandy loam, sandy loam.	SM, SC, SC-SM	A-4, A-2	0	100	100	85-95	30-50	15-30	NP-10
	26-60	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM, SC-SM	A-2, A-3	0	100	100	80-95	5-20	10-20	NP-5
179D2, 179E2-----	0-7	Loam----------	CL	A-6, A-7	0	90-95	85-95	70-85	55-75	35-45	15-25
Gara	7-43	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	43-60	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
179E3----------	0-6	Clay loam--------	CL	A-6, A-7	0	90-95	85-95	70-85	55-75	35-45	15-25
Gara	6-43	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	43-60	Loam, clay loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
179F2----------	0-7	Loam----------	CL	A-6, A-7	0	90-95	85-95	70-85	55-75	35-45	15-25
Gara	7-43	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	43-60	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
179F3----------	0-6	Clay loam--------	CL	A-6, A-7	0	90-95	85-95	70-85	55-75	35-45	15-25
Gara	6-43	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	43-60	Loam, clay loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
184----------	0-19	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
Klinger	19-37	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	20-30
	37-60	Loam, clay loam, loamy sand.	CL	A-6	0-5	90-95	85-90	75-85	55-65	25-35	10-20
220----------	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
Nodaway	10-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-40	5-15
225----------	0-8	Loam----------	CL, ML	A-6, A-7	0	100	90-100	70-90	55-75	35-45	10-20
Lawler	8-28	Loam, sandy clay loam, clay loam.	CL, SC	A-6	0-5	85-95	80-95	70-85	45-65	25-40	10-20
	28-60	Gravelly coarse sand, gravelly loamy sand, loamy coarse sand.	SW, GP, SP, SW-SM	A-1	2-10	50-90	50-85	20-40	3-10	---	NP
254----------	0-27	Silty clay-------	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
Zook	27-53	Silty clay-------	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
	53-60	Loamy sand, fine sand, sand.	SP-SM, SM	A-2, A-3, A-4	0	85-100	85-100	50-95	5-50	---	NP
273C----------	0-30	Loam----------	CL	A-6	0	100	90-100	85-95	60-80	30-40	11-20
Olmitz	30-60	Loam, clay loam	CL	A-6	0	100	90-100	85-95	60-80	30-40	11-20
284----------	0-16	Sandy loam-------	SC, SC-SM	A-2, A-4	0	95-100	90-95	60-70	25-40	15-25	5-10
Flagler	16-22	Sandy loam-------	SC, SC-SM	A-2, A-4	0	95-100	90-95	50-70	25-40	15-25	5-10
	22-60	Loamy sand, gravelly sand, sand.	SP-SM, SW, SP, SW-SM	A-1	0-5	70-90	70-85	20-40	3-12	---	NP
291----------	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	95-100	25-40	5-15
Atterberry	8-60	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0	100	100	95-100	95-100	35-55	15-30

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
293C*, 293E*:											
Chelsea	0-8	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-95	10-35	---	NP
	8-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-95	3-15	---	NP
Lamont	0-14	Fine sandy loam	SC-SM, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	14-48	Fine sandy loam, loam, sandy clay loam.	SC-SM, SC	A-2, A-4	0	100	100	85-95	30-50	20-30	5-10
	48-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	70-90	5-25	---	NP
Fayette	0-11	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	11-47	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	47-60	Loamy fine sand, loamy sand, fine sand.	SP-SM, SM, SC-SM	A-2, A-3	0	100	95-100	80-90	5-20	<20	NP-5
293F*:											
Chelsea	0-8	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-95	10-35	---	NP
	8-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-95	3-15	---	NP
Lamont	0-14	Fine sandy loam	SC-SM, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	14-48	Fine sandy loam, loam, sandy clay loam.	SC-SM, SC	A-2, A-4	0	100	100	85-95	30-50	20-30	5-10
	48-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	70-90	5-25	---	NP
Fayette	0-9	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	9-43	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	43-60	Loamy fine sand, loamy sand, fine sand.	SP-SM, SM, SC-SM	A-2, A-3	0	100	95-100	80-90	5-20	<20	NP-5
313G	0-11	Silt loam	CL, CL-ML	A-4, A-6	0	100	90-100	90-100	70-100	25-40	5-15
Gosport	11-38	Clay, silty clay, silty clay loam.	CH	A-7	0	100	90-100	90-100	85-100	50-65	35-50
	38-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
352B, 352C2	0-8	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-95	25-35	5-15
Whittier	8-32	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-95	35-45	15-25
	32-36	Loam, sandy loam	CL, SC	A-6, A-4	0	100	95-100	80-90	45-75	25-40	8-20
	36-60	Loamy fine sand, fine sand, loamy sand.	SM, SC-SM, SP-SM	A-2, A-3	0	100	95-100	80-90	5-20	<20	NP-5
354*	0-60	Variable	---	---	---	---	---	---	---	---	---
Aquolls											
377B, 377C, 377C2	0-13	Silty clay loam	ML, CL	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Dinsdale	13-35	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	35-60	Loam, clay loam, sandy loam.	CL	A-6	0-5	90-95	85-90	75-85	55-65	25-35	10-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
382----------	0-22	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	45-55	20-30
Maxfield	22-38	Silty clay loam, silt loam.	CH, CL	A-7	0	100	100	100	95-100	45-55	25-35
	38-60	Loam----------	CL	A-6	0-5	90-95	85-90	75-85	55-65	25-35	10-20
420B----------	0-19	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	19-60	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
426B, 426C, 426C2, 426D2----	0-14	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	85-95	55-75	25-35	5-15
Aredale	14-36	Loam, clay loam	CL, SC	A-6	0-5	100	100	80-90	45-70	30-40	10-20
	36-48	Sandy loam, loamy sand.	SC, SM, SC-SM	A-2, A-4	0-5	100	100	70-90	20-50	<25	NP-10
	48-60	Loam----------	CL	A-6	2-5	90-95	85-95	80-90	50-65	25-35	11-20
428B----------	0-29	Silty clay loam	CL, OL, OH, MH	A-7, A-6	0	100	100	95-100	95-100	30-55	10-25
Ely	29-51	Silty clay loam	CL, ML	A-7, A-6	0	100	100	95-100	95-100	35-50	10-25
	51-60	Silt loam, silty clay loam, loam.	CL	A-6	0	100	100	90-100	85-100	25-40	10-20
430, 430B--------	0-7	Silt loam--------	CL, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	8-20
Ackmore	7-27	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	8-20
	27-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	95-100	85-100	35-60	15-30
442C2*, 442D2*, 442E2*:											
Tama----------	0-7	Silty clay loam	CL, ML	A-6, A-7	0	100	100	100	95-100	35-45	10-20
	7-19	Silty clay loam	CL-ML, CL	A-6, A-7	0	100	100	100	95-100	35-45	10-20
	19-40	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	95-100	35-50	15-25
	40-45	Sandy loam, loam	SC-SM, SC	A-4	0	100	95-100	80-90	35-50	20-30	5-10
	45-60	Loamy fine sand, loamy sand, fine sand.	SP-SM, SM, SC-SM	A-2, A-3	0	100	95-100	80-90	5-20	<20	NP-5
Dickinson------	0-8	Fine sandy loam	SM, SC, SC-SM	A-4, A-2	0	100	100	85-95	30-50	15-30	NP-10
	8-26	Fine sandy loam, sandy loam.	SM, SC, SC-SM	A-4, A-2	0	100	100	85-95	30-50	15-30	NP-10
	26-60	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM, SC-SM	A-2, A-3	0	100	100	80-95	5-20	10-20	NP-5
450B----------	0-15	Silt loam--------	CL	A-6	0	100	90-100	85-100	85-100	25-40	10-20
Pillot	15-34	Silty clay loam, sandy clay loam, loam.	CL	A-6, A-7	0	100	90-100	70-100	50-100	30-45	10-25
	34-60	Loamy sand, sand, sandy loam.	SC-SM, SM, SP-SM	A-2, A-1, A-3	0-5	75-100	75-100	25-70	5-25	<25	NP-5
450C2----------	0-8	Silt loam--------	CL	A-6	0	100	90-100	85-100	85-100	25-40	10-20
Pillot	8-30	Silty clay loam, sandy clay loam, loam.	CL	A-6, A-7	0	100	90-100	70-100	50-100	30-45	10-25
	30-60	Loamy sand, sand, sandy loam.	SC-SM, SM, SP-SM	A-2, A-1, A-3	0-5	75-100	75-100	25-70	5-25	<25	NP-5

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
484---------- Lawson	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	85-100	20-40	5-20
	8-35	Silt loam, silty clay loam.	CL, CL-ML	A-4	0	100	100	90-100	85-100	20-30	5-10
	35-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	60-100	20-45	10-25
499G---------- Nordness	0-6	Silt loam--------	CL, CL-ML	A-4	0	100	100	90-100	70-90	20-30	5-10
	6-14	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	100	100	90-100	70-90	30-45	15-25
	14-60	Unweathered bedrock, weathered bedrock.	---	---	---	---	---	---	---	---	---
539---------- Perks	0-4	Sandy loam-------	SM, SC-SM, SC	A-4	0	100	100	75-80	35-50	15-30	NP-10
	4-60	Sand, loamy sand	SM, SP, SP-SM	A-1	0	90-100	90-95	30-50	3-20	---	NP
673D3, 673E3, 673F3---------- Timula	0-34	Silt loam--------	ML	A-4	0	100	100	95-100	85-100	25-35	NP-10
	34-60	Silt loam, silt	ML	A-4	0	100	100	95-100	85-100	25-35	NP-10
763E3, 763F3----- Exette	0-8	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	100	95-100	25-35	5-10
	8-46	Silt loam--------	ML, CL	A-6, A-4	0	100	100	100	95-100	30-40	7-15
	46-60	Silt loam--------	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	7-15
767E3, 767F3----- Mula	0-23	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	95-100	85-100	25-35	5-10
	23-60	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	95-100	85-100	25-35	5-10
814---------- Rockton	0-21	Loam-------------	ML, CL-ML, CL	A-4	0	90-100	90-100	85-95	50-75	25-35	5-10
	21-34	Loam, sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	90-100	90-100	75-90	45-70	30-45	10-20
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
820, 820B-------- Dockery	0-7	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	85-100	25-35	5-15
	7-60	Stratified sandy loam to silty clay loam.	CL-ML, CL, SC	A-4, A-6	0	100	100	65-95	35-85	25-35	5-12
826---------- Rowley	0-23	Silt loam--------	CL	A-4, A-6	0	100	100	90-100	85-95	25-35	8-13
	23-44	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	85-95	30-50	10-25
	44-57	Stratified silt loam to sand.	CL, CL-ML, SC, SC-SM	A-4, A-6	0	100	100	80-100	35-75	20-30	4-11
	57-64	Sand, fine sand	SM, SP-SM	A-2, A-3	0	100	100	50-90	5-35	---	NP
916B, 916C2, 916D2---------- Downs	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	8-44	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
	44-50	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
	50-60	Loamy fine sand, loamy sand, fine sand.	SP-SM, SM, SC-SM	A-2, A-3	0	100	95-100	50-80	5-20	<20	NP-5

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
920B----------	0-19	Silty clay loam	CL, ML	A-6, A-7	0	100	100	100	95-100	35-45	10-20
Tama	19-49	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	95-100	35-50	15-25
	49-60	Loamy fine sand, loamy sand, fine sand.	SP-SM, SM, SC-SM	A-2, A-3	0	100	95-100	80-90	5-20	<20	NP-5
920C2, 920D2-----	0-7	Silty clay loam	CL, ML	A-6, A-7	0	100	100	100	95-100	35-45	10-20
Tama	7-19	Silty clay loam	CL-ML, CL	A-6, A-7	0	100	100	100	95-100	35-45	10-20
	19-40	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	95-100	35-50	15-25
	40-45	Sandy loam, loam	SC-SM, SC	A-4	0	100	95-100	80-90	35-50	20-30	5-10
	45-60	Loamy fine sand, loamy sand, fine sand.	SP-SM, SM, SC-SM	A-2, A-3	0	100	95-100	80-90	5-20	<20	NP-5
926----------	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Canoe	8-23	Silt loam--------	CL-ML, CL	A-4	0	100	100	100	95-100	20-30	5-10
	23-60	Silt loam, silty clay loam.	CL	A-6	0	100	100	100	95-100	30-40	10-20
950, 950B--------	0-8	Silt loam--------	CL, ML	A-4, A-6	0	100	100	95-100	90-100	30-40	5-15
Niota	8-60	Silty clay, clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	52-76	26-42
960----------	0-22	Loam----------	CL	A-6	0	100	100	85-95	60-70	30-40	11-20
Shaffton	22-55	Loam----------	CL, CL-ML	A-4, A-6	0	100	100	85-95	55-65	25-35	5-15
	55-60	Coarse sand, fine sand, sand.	SW, SP, SW-SM, SP-SM	A-1	0	90-100	90-95	20-35	3-5	---	NP
961----------	0-21	Clay loam--------	CL	A-6, A-7	0	100	100	85-95	70-95	30-45	10-20
Ambraw	21-27	Clay loam, clay, silty clay loam.	CL, CH	A-6, A-7	0	100	100	80-90	60-80	35-55	15-30
	27-48	Clay loam, sandy clay loam.	CL	A-7, A-6	0	100	90-100	85-95	50-85	30-50	10-25
	48-60	Stratified silty clay loam to sandy loam.	SC, ML, CL, SM	A-6, A-4	0	100	90-100	80-90	40-80	20-40	NP-17
977----------	0-23	Silt loam--------	CL, ML	A-4, A-6	0	100	100	90-100	85-95	25-35	8-13
Richwood	23-58	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	100	90-100	85-95	25-40	7-20
	58-65	Fine sand, sand	SM, SP-SM	A-2, A-3	0	100	100	50-80	5-35	---	NP
1118----------	0-20	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	45-55	20-30
Garwin	20-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	45-55	25-35
1119----------	0-15	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
Muscatine	15-47	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	20-30
	47-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
1539*:											
Ambraw----------	0-21	Clay loam--------	CL	A-6, A-7	0	100	100	85-95	70-95	30-45	10-20
	21-27	Clay loam, clay, silty clay loam.	CL, CH	A-6, A-7	0	100	100	80-90	60-80	35-55	15-30
	27-48	Clay loam, sandy clay loam.	CL	A-7, A-6	0	100	90-100	85-95	50-85	30-50	10-25
	48-60	Stratified silty clay loam to sandy loam.	SC, ML, CL, SM	A-6, A-4	0	100	90-100	80-90	40-80	20-40	NP-17
Perks----------	0-4	Sandy loam-------	SM, SC-SM, SC	A-4	0	100	100	75-80	35-50	15-30	NP-10
	4-60	Sand, loamy sand	SM, SP, SP-SM	A-1	0	90-100	90-95	30-50	3-20	---	NP
Lawson----------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	85-100	20-40	5-20
	8-35	Silt loam, silty clay loam.	CL, CL-ML	A-4	0	100	100	90-100	85-100	20-30	5-10
	35-60	Stratified silty clay loam to sandy loam.	CL-ML, CL, SC-SM, SC	A-4, A-6	0	100	100	60-100	35-85	20-35	5-20
1730B*:											
Nodaway---------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
	8-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-40	5-15
Perks----------	0-4	Sandy loam-------	SM, SC-SM, SC	A-4	0	100	100	75-80	35-50	15-30	NP-10
	4-60	Sand, loamy sand	SM, SP, SP-SM	A-1	0	90-100	90-95	30-50	3-20	---	NP
4000*.											
Urban land											
4133*:											
Colo----------	0-31	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-60	15-30
	31-60	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-55	20-30
Urban land.											
4162C*, 4162D*:											
Downs----------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	8-60	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	35-45	15-25
Urban land.											
4163E*:											
Fayette---------	0-11	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	11-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
Urban land.											
4220*:											
Nodaway---------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
	8-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-40	5-15

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
4220*:											
Urban land.											
4291*:											
Atterberry------	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	95-100	25-40	5-15
	8-60	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0	100	100	95-100	95-100	35-55	15-30
Urban land.											
4977B*:											
Richwood--------	0-23	Silt loam--------	CL, ML	A-4, A-6	0	100	100	90-100	85-95	25-35	8-13
	23-58	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	100	90-100	85-95	25-40	7-20
	58-60	Fine sand, sand	SM, SP-SM	A-2, A-3	0	100	100	50-80	5-35	---	NP
Urban land.											
5010*.											
Pits											
5030*.											
Pits											
5040*----------	0-60	Clay loam--------	---	---	---	---	---	---	---	---	15-30
Orthents, loamy	60-80	Variable---------	---	---	---	---	---	---	---	---	---
5080*.											
Orthents											

* See description of the map unit for composition and behavior characteristics of the map unit.

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" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				
11B*:										
Colo	0-11	27-36	1.28-1.32	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.28	5	7
	11-31	30-35	1.25-1.35	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.28		
	31-60	25-35	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.3	Moderate	0.32		
Ely	0-29	27-30	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.28	5	7
	29-51	28-35	1.30-1.40	0.6-2.0	0.18-0.20	6.1-7.3	Moderate	0.43		
	51-60	20-30	1.40-1.45	0.6-2.0	0.18-0.20	6.6-8.4	Moderate	0.43		
20C2	0-7	28-33	1.30-1.35	0.6-2.0	0.21-0.23	6.1-7.3	Moderate	0.32	5	7
Killduff	7-19	30-35	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
	19-60	26-32	1.40-1.45	0.6-2.0	0.20-0.22	6.1-7.3	Moderate	0.43		
20C3	0-7	28-33	1.30-1.35	0.6-2.0	0.21-0.23	6.1-7.3	Moderate	0.43	4	7
Killduff	7-19	30-35	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
	19-60	26-32	1.40-1.45	0.6-2.0	0.20-0.22	6.1-7.3	Moderate	0.43		
20D2	0-7	28-33	1.30-1.35	0.6-2.0	0.21-0.23	6.1-7.3	Moderate	0.32	5	7
Killduff	7-19	30-35	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
	19-60	26-32	1.40-1.45	0.6-2.0	0.20-0.22	6.1-7.3	Moderate	0.43		
20D3	0-7	28-33	1.30-1.35	0.6-2.0	0.21-0.23	6.1-7.3	Moderate	0.43	4	7
Killduff	7-19	30-35	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
	19-60	26-32	1.40-1.45	0.6-2.0	0.20-0.22	6.1-7.3	Moderate	0.43		
24D3	0-6	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.1-7.3	Moderate	0.37	4	6
Shelby	6-47	30-35	1.55-1.65	0.2-0.6	0.16-0.18	5.1-7.3	Moderate	0.37		
	47-60	30-35	1.55-1.65	0.2-0.6	0.16-0.18	6.6-8.4	Moderate	0.37		
24E2	0-6	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.1-7.3	Moderate	0.32	5	6
Shelby	6-47	30-35	1.50-1.55	0.2-0.6	0.16-0.18	5.1-7.3	Moderate	0.28		
	47-60	30-35	1.55-1.65	0.2-0.6	0.16-0.18	6.6-8.4	Moderate	0.37		
24E3	0-6	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.1-7.3	Moderate	0.37	4	6
Shelby	6-47	30-35	1.55-1.65	0.2-0.6	0.16-0.18	5.1-7.3	Moderate	0.37		
	47-60	30-35	1.55-1.65	0.2-0.6	0.16-0.18	6.6-8.4	Moderate	0.37		
41, 41B, 41C, 41D	0-23	3-10	1.20-1.40	2.0-6.0	0.09-0.12	5.1-7.3	Low	0.17	5	2
Sparta	23-36	1-8	1.40-1.60	6.0-20	0.05-0.11	5.1-7.3	Low	0.17		
	36-60	0-5	1.50-1.70	6.0-20	0.04-0.07	5.1-7.8	Low	0.17		
54	0-8	35-40	1.30-1.35	0.2-0.6	0.21-0.23	5.6-7.3	High	0.37	5	7
Zook	8-45	38-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.8	High	0.28		
	45-60	20-45	1.30-1.45	0.06-0.6	0.11-0.22	5.6-7.8	High	0.28		
63C, 63E	0-8	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low	0.17	5	2
Chelsea	8-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.5	Low	0.17		
65E2, 65F, 65G	0-6	18-27	1.20-1.40	0.6-2.0	0.16-0.18	4.5-7.3	Low	0.32	5	6
Lindley	6-48	25-35	1.40-1.60	0.2-0.6	0.14-0.18	4.5-6.5	Moderate	0.32		
	48-60	18-32	1.45-1.65	0.2-0.6	0.12-0.16	6.1-7.8	Moderate	0.32		
83B	0-18	18-26	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.24	5	6
Kenyon	18-60	20-30	1.45-1.65	0.6-2.0	0.17-0.19	5.1-7.3	Low	0.28		

See footnote at end of table.

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		Wind erodibility group
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				
83C2, 83D2------- Kenyon	0-18 18-60	18-26 20-30	1.40-1.45 1.45-1.65	0.6-2.0 0.6-2.0	0.20-0.22 0.17-0.19	5.6-7.3 5.1-7.3	Low---------- Low----------	0.28 0.28	5	6
83D3------------- Kenyon	0-8 8-42 42-60	18-26 20-30 20-24	1.40-1.45 1.45-1.65 1.65-1.75	0.6-2.0 0.6-2.0 0.6-2.0	0.20-0.22 0.17-0.19 0.17-0.19	5.6-7.3 5.1-7.3 6.6-8.4	Low---------- Low---------- Low----------	0.28 0.28 0.37	4	6
84--------------- Clyde	0-22 22-42 42-48 48-60	28-32 22-28 10-22 20-24	1.35-1.40 1.45-1.65 1.60-1.70 1.65-1.75	0.6-2.0 0.6-2.0 2.0-6.0 0.6-2.0	0.21-0.23 0.18-0.20 0.11-0.13 0.17-0.19	6.1-7.3 6.1-7.3 6.1-7.3 6.6-8.4	Moderate----- Moderate----- Low---------- Moderate-----	0.24 0.37 0.37 0.37	5	6
118-------------- Garwin	0-18 18-60	30-35 27-35	1.30-1.35 1.28-1.35	0.6-2.0 0.6-2.0	0.21-0.23 0.18-0.20	5.6-7.3 6.1-7.3	High--------- High---------	0.28 0.28	5	7
119, 119B-------- Muscatine	0-15 15-47 47-60	28-30 30-35 22-30	1.30-1.35 1.28-1.35 1.35-1.40	0.6-2.0 0.6-2.0 0.6-2.0	0.22-0.24 0.18-0.20 0.18-0.20	5.1-7.3 5.1-7.3 6.6-7.8	Moderate----- Moderate----- Moderate-----	0.28 0.43 0.43	5	7
120B------------- Tama	0-19 19-60	27-29 27-35	1.25-1.30 1.30-1.35	0.6-2.0 0.6-2.0	0.22-0.24 0.18-0.20	5.1-7.3 5.1-6.5	Moderate----- Moderate-----	0.28 0.43	5-4	7
120B2------------ Tama	0-7 7-19 19-60	27-32 27-32 27-35	1.25-1.30 1.25-1.30 1.30-1.35	0.6-2.0 0.6-2.0 0.6-2.0	0.22-0.24 0.22-0.24 0.18-0.20	5.1-7.3 5.1-7.3 5.1-6.5	Moderate----- Moderate----- Moderate-----	0.32 0.32 0.43	5	7
120C------------- Tama	0-17 17-60	27-29 27-35	1.25-1.30 1.30-1.35	0.6-2.0 0.6-2.0	0.22-0.24 0.18-0.20	5.1-7.3 5.1-6.5	Moderate----- Moderate-----	0.28 0.43	5-4	7
120C2------------ Tama	0-7 7-19 19-60	27-32 27-32 27-35	1.25-1.30 1.25-1.30 1.30-1.35	0.6-2.0 0.6-2.0 0.6-2.0	0.22-0.24 0.22-0.24 0.18-0.20	5.1-7.3 5.1-7.3 5.1-6.5	Moderate----- Moderate----- Moderate-----	0.32 0.32 0.43	5	7
120C3------------ Tama	0-6 6-19 19-60	30-35 30-35 22-28	1.25-1.30 1.30-1.35 1.35-1.40	0.6-2.0 0.6-2.0 0.6-2.0	0.22-0.24 0.18-0.20 0.18-0.20	5.1-7.3 5.1-6.5 5.6-7.3	Moderate----- Moderate----- Moderate-----	0.43 0.43 0.43	4	7
120D2------------ Tama	0-7 7-19 19-60	27-32 27-32 27-35	1.25-1.30 1.25-1.30 1.30-1.35	0.6-2.0 0.6-2.0 0.6-2.0	0.22-0.24 0.22-0.24 0.18-0.20	5.1-7.3 5.1-7.3 5.1-6.5	Moderate----- Moderate----- Moderate-----	0.32 0.32 0.43	5	7
120D3------------ Tama	0-6 6-19 19-60	30-35 30-35 22-28	1.25-1.30 1.30-1.35 1.35-1.40	0.6-2.0 0.6-2.0 0.6-2.0	0.22-0.24 0.18-0.20 0.18-0.20	5.1-7.3 5.1-6.5 5.6-7.3	Moderate----- Moderate----- Moderate-----	0.43 0.43 0.43	4	7
120E2------------ Tama	0-7 7-19 19-60	27-32 27-32 27-35	1.25-1.30 1.25-1.30 1.30-1.35	0.6-2.0 0.6-2.0 0.6-2.0	0.22-0.24 0.22-0.24 0.18-0.20	5.1-7.3 5.1-7.3 5.1-6.5	Moderate----- Moderate----- Moderate-----	0.32 0.32 0.43	5	7
120E3------------ Tama	0-6 6-19 19-60	30-35 30-35 22-28	1.25-1.30 1.30-1.35 1.35-1.40	0.6-2.0 0.6-2.0 0.6-2.0	0.22-0.24 0.18-0.20 0.18-0.20	5.1-7.3 5.1-6.5 5.6-7.3	Moderate----- Moderate----- Moderate-----	0.43 0.43 0.43	4	7
133-------------- Colo	0-11 11-31 31-60	27-36 30-35 25-35	1.28-1.32 1.25-1.35 1.35-1.45	0.6-2.0 0.6-2.0 0.6-2.0	0.21-0.23 0.18-0.20 0.18-0.20	5.6-7.3 5.6-7.3 6.1-7.3	Moderate----- Moderate----- Moderate-----	0.28 0.28 0.32	5	7
139-------------- Perks	0-4 4-60	2-10 2-10	1.50-1.55 1.50-1.75	6.0-20 6.0-20	0.07-0.09 0.02-0.04	5.6-7.3 5.6-7.3	Low---------- Low----------	0.15 0.15	5	1

See footnote at end of table.

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		Wind erodibility group
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				
151----------	0-9	27-35	1.30-1.40	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.28	4	6
Marshan	9-28	18-30	1.45-1.55	0.6-2.0	0.15-0.19	5.6-7.3	Low----------	0.28		
	28-60	0-5	1.55-1.65	6.0-20	0.02-0.05	5.6-7.3	Low----------	0.15		
160----------	0-9	20-26	1.35-1.40	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.32	5	6
Walford	9-13	18-26	1.40-1.50	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.43		
	13-60	27-35	1.35-1.40	0.2-0.6	0.18-0.20	5.1-6.5	High---------	0.43		
162B----------	0-8	18-26	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Low----------	0.32	5	6
Downs	8-60	25-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate-----	0.43		
162C2----------	0-8	18-26	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Low----------	0.32	5	6
Downs	8-60	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate-----	0.43		
162C3----------	0-8	27-32	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate-----	0.43	4	7
Downs	8-60	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate-----	0.43		
162D2----------	0-8	18-26	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Low----------	0.32	5	6
Downs	8-60	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate-----	0.43		
162D3----------	0-8	27-32	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate-----	0.43	4	7
Downs	8-60	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate-----	0.43		
162E2----------	0-8	18-26	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Low----------	0.32	5	6
Downs	8-60	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate-----	0.43		
162E3----------	0-8	27-32	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate-----	0.43	4	7
Downs	8-60	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate-----	0.43		
162F2----------	0-8	18-26	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Low----------	0.32	5	6
Downs	8-60	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate-----	0.43		
163B2----------	0-6	25-27	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37	5	6
Fayette	6-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.43		
163C----------	0-11	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.32	5	6
Fayette	11-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.43		
163C2----------	0-8	25-27	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37	5	6
Fayette	8-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.43		
163C3----------	0-8	27-32	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43	4	7
Fayette	8-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.43		
163D----------	0-11	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.32	5	6
Fayette	11-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.43		
163D2----------	0-8	25-27	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37	5	6
Fayette	8-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.43		
163D3----------	0-8	27-32	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43	4	7
Fayette	8-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.43		
163E----------	0-11	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.32	5	6
Fayette	11-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.43		
163E2----------	0-8	25-27	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37	5	6
Fayette	8-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.43		

See footnote at end of table.

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		Wind erodibility group
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				
163E3----------	0-8	27-32	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43	4	7
Fayette	8-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.43		
163F----------	0-9	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.32	5	6
Fayette	9-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.43		
163F2----------	0-8	25-27	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37	5	6
Fayette	8-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.43		
163F3----------	0-8	27-32	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43	4	7
Fayette	8-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.43		
163G----------	0-8	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.32	5	6
Fayette	8-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.43		
174----------	0-23	20-26	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.24	4	6
Bolan	23-39	12-20	1.45-1.50	0.6-2.0	0.17-0.19	5.6-6.5	Low----------	0.24		
	39-48	10-16	1.50-1.60	2.0-6.0	0.11-0.13	5.6-7.3	Low----------	0.24		
	48-60	2-8	1.60-1.70	6.0-20	0.08-0.10	5.6-7.3	Low----------	0.17		
175, 175B, 175C--	0-8	10-18	1.50-1.55	2.0-6.0	0.12-0.15	5.6-7.3	Low----------	0.20	4	3
Dickinson	8-26	10-18	1.50-1.55	2.0-6.0	0.12-0.15	5.6-7.3	Low----------	0.20		
	26-60	4-10	1.55-1.65	6.0-20	0.08-0.10	5.1-6.5	Low----------	0.20		
179D2, 179E2-----	0-7	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.6-7.3	Moderate-----	0.32	5	6
Gara	7-43	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-6.5	Moderate-----	0.32		
	43-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	5.6-8.4	Moderate-----	0.37		
179E3----------	0-6	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.6-7.3	Moderate-----	0.37	4	6
Gara	6-43	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-6.5	Moderate-----	0.32		
	43-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	5.6-8.4	Moderate-----	0.37		
179F2----------	0-7	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.6-7.3	Moderate-----	0.32	5	6
Gara	7-43	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-6.5	Moderate-----	0.32		
	43-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	5.6-8.4	Moderate-----	0.37		
179F3----------	0-6	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.6-7.3	Moderate-----	0.37	4	6
Gara	6-43	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-6.5	Moderate-----	0.32		
	43-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	5.6-8.4	Moderate-----	0.37		
184----------	0-19	27-30	1.30-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Moderate-----	0.28	5	7
Klinger	19-37	28-35	1.35-1.45	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.43		
	37-60	20-28	1.65-1.75	0.6-2.0	0.17-0.19	5.1-7.8	Low----------	0.43		
220----------	0-10	18-27	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Low----------	0.32	5	6
Nodaway	10-60	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate-----	0.43		
225----------	0-8	18-27	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.24	4	6
Lawler	8-28	20-28	1.45-1.60	0.6-2.0	0.16-0.18	5.1-6.5	Low----------	0.28		
	28-60	2-8	1.60-1.75	>20	0.02-0.04	5.1-7.3	Low----------	0.10		
254----------	0-27	40-44	1.35-1.40	0.06-0.2	0.11-0.13	5.6-7.3	High----------	0.28	5	4
Zook	27-53	40-45	1.35-1.40	0.06-0.2	0.11-0.13	5.6-7.8	High----------	0.28		
	53-60	1-8	1.40-1.60	6.0-20	0.05-0.11	5.6-7.8	Low----------	0.17		
273C----------	0-30	24-27	1.40-1.45	0.6-2.0	0.19-0.21	5.6-7.3	Moderate-----	0.24	5	6
Olmitz	30-60	24-30	1.40-1.45	0.6-2.0	0.19-0.21	5.6-7.3	Moderate-----	0.28		
284----------	0-16	12-18	1.50-1.55	2.0-6.0	0.12-0.14	5.6-7.3	Low----------	0.20	4	3
Flagler	16-22	10-15	1.55-1.60	2.0-6.0	0.11-0.13	5.1-6.5	Low----------	0.20		
	22-60	2-8	1.60-1.75	>20	0.02-0.04	5.1-7.3	Low----------	0.20		

See footnote at end of table.

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		Wind erodibility group
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				
291----------	0-8	20-26	1.35-1.55	0.6-2.0	0.22-0.25	5.6-7.3	Low----------	0.32	5	6
Atterberry	8-60	25-35	1.40-1.60	0.6-2.0	0.14-0.24	5.1-7.3	Moderate-----	0.43		
293C*, 293E*:										
Chelsea----------	0-8	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low----------	0.17	5	2
	8-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.5	Low----------	0.17		
Lamont----------	0-14	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low----------	0.24	5	3
	14-48	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-7.3	Low----------	0.24		
	48-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low----------	0.17		
Fayette----------	0-11	15-25	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.32	5	6
	11-47	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37		
	47-60	3-10	1.30-1.35	6.0-20	0.05-0.10	5.1-7.3	Low----------	0.17		
293F*:										
Chelsea----------	0-8	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low----------	0.17	5	2
	8-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.5	Low----------	0.17		
Lamont----------	0-14	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low----------	0.24	5	3
	14-48	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-7.3	Low----------	0.24		
	48-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low----------	0.17		
Fayette----------	0-9	15-25	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.32	5	6
	9-43	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37		
	43-60	3-10	1.30-1.35	6.0-20	0.05-0.10	5.1-7.3	Low----------	0.17		
313G----------	0-11	18-27	1.30-1.40	0.2-0.6	0.18-0.20	5.1-6.5	Low----------	0.43	3	6
Gosport	11-38	36-60	1.50-1.60	<0.06	0.12-0.14	3.6-5.5	High----------	0.32		
	38-60	---	---	<0.06	---	---	----------	----		
352B----------	0-8	18-26	1.25-1.30	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.28	4	6
Whittier	8-32	28-32	1.30-1.40	0.6-2.0	0.17-0.19	5.1-7.3	Moderate-----	0.43		
	32-36	12-18	1.50-1.60	0.6-2.0	0.16-0.18	5.1-6.5	Low----------	0.32		
	36-60	2-10	1.60-1.70	6.0-20	0.04-0.07	5.1-6.5	Low----------	0.17		
352C2----------	0-8	18-26	1.25-1.30	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.32	4	6
Whittier	8-32	28-32	1.30-1.40	0.6-2.0	0.17-0.19	5.1-7.3	Moderate-----	0.43		
	32-36	12-18	1.50-1.60	0.6-2.0	0.16-0.18	5.1-6.5	Low----------	0.32		
	36-60	2-10	1.60-1.70	6.0-20	0.04-0.07	5.1-6.5	Low----------	0.17		
354*----------	0-60	---	---	0.6-6.0	---	---	----------	----	---	8
Aquolls										
377B, 377C-------	0-13	27-32	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate-----	0.28	5	7
Dinsdale	13-35	30-34	1.30-1.35	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43		
	35-60	20-28	1.65-1.75	0.6-2.0	0.17-0.19	5.6-8.4	Low----------	0.43		
377C2----------	0-13	27-32	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate-----	0.32	5	7
Dinsdale	13-35	30-34	1.30-1.35	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43		
	35-60	20-28	1.65-1.75	0.6-2.0	0.17-0.19	5.6-8.4	Low----------	0.43		
382----------	0-22	27-35	1.35-1.40	0.6-2.0	0.21-0.23	6.6-7.3	High----------	0.28	5	7
Maxfield	22-38	25-34	1.40-1.50	0.6-2.0	0.18-0.20	6.1-7.3	High----------	0.32		
	38-60	20-26	1.65-1.75	0.6-2.0	0.17-0.19	6.1-7.8	Low----------	0.32		
420B----------	0-19	27-29	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate-----	0.28	5-4	7
Tama	19-60	27-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.43		

See footnote at end of table.

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		Wind erodibility group
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				
426B, 426C------- Aredale	0-14	18-26	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.24	5	6
	14-36	18-28	1.45-1.65	0.6-2.0	0.17-0.19	5.1-6.0	Low----------	0.32		
	36-48	8-15	1.60-1.70	2.0-6.0	0.11-0.13	5.1-6.0	Low----------	0.20		
	48-60	18-24	1.70-1.80	0.6-2.0	0.17-0.19	5.6-7.3	Low----------	0.37		
426C2, 426D2----- Aredale	0-14	18-26	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.28	5	6
	14-36	18-28	1.45-1.65	0.6-2.0	0.17-0.19	5.1-6.0	Low----------	0.32		
	36-48	8-15	1.60-1.70	2.0-6.0	0.11-0.13	5.1-6.0	Low----------	0.20		
	48-60	18-24	1.70-1.80	0.6-2.0	0.17-0.19	5.6-7.3	Low----------	0.37		
428B------------- Ely	0-29	27-30	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.28	5	7
	29-51	28-35	1.30-1.40	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.43		
	51-60	20-30	1.40-1.45	0.6-2.0	0.18-0.20	6.6-8.4	Moderate-----	0.43		
430, 430B-------- Ackmore	0-7	18-27	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.32	5	6
	7-27	18-30	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.32		
	27-60	26-38	1.30-1.40	0.6-2.0	0.18-0.20	5.6-7.8	High---------	0.32		
442C2*, 442D2*, 442E2*: Tama-----------	0-7	27-35	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate-----	0.32	5	7
	7-19	27-35	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate-----	0.32		
	19-40	20-35	1.30-1.35	0.6-2.0	0.19-0.22	5.1-6.0	Moderate-----	0.43		
	40-45	15-20	1.30-1.35	2.0-6.0	0.11-0.17	5.1-6.5	Low----------	0.24		
	45-60	3-10	1.30-1.35	6.0-20	0.05-0.10	5.1-7.3	Low----------	0.17		
Dickinson------	0-8	10-18	1.50-1.55	2.0-6.0	0.12-0.15	5.6-7.3	Low----------	0.20	4	3
	8-26	10-18	1.50-1.55	2.0-6.0	0.12-0.15	5.6-7.3	Low----------	0.20		
	26-60	4-10	1.55-1.65	6.0-20	0.08-0.10	5.1-6.5	Low----------	0.20		
450B------------- Pillot	0-15	20-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-6.5	Low----------	0.32	4	6
	15-34	27-35	1.30-1.50	0.6-2.0	0.16-0.20	5.6-7.3	Moderate-----	0.43		
	34-60	2-10	1.60-1.70	2.0-20	0.05-0.13	5.6-7.3	Low----------	0.17		
450C2------------ Pillot	0-8	20-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-6.5	Low----------	0.32	4	6
	8-30	27-35	1.30-1.50	0.6-2.0	0.16-0.20	5.6-7.3	Moderate-----	0.43		
	30-60	2-10	1.60-1.70	2.0-20	0.05-0.13	5.6-7.3	Low----------	0.17		
484-------------- Lawson	0-8	10-27	1.20-1.55	0.6-2.0	0.22-0.24	6.1-7.8	Low----------	0.28	5	5
	8-35	10-30	1.20-1.55	0.6-2.0	0.18-0.22	6.1-7.8	Low----------	0.28		
	35-60	18-30	1.55-1.65	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.43		
499G------------- Nordness	0-6	18-24	1.30-1.35	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.32	2	6
	6-14	22-29	1.35-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.32		
	14-60	---	---	<0.06	---	---	----------	----		
539-------------- Perks	0-4	10-15	1.50-1.55	2.0-6.0	0.12-0.15	5.6-7.3	Low----------	0.24	5	3
	4-60	2-10	1.50-1.75	6.0-20	0.02-0.04	5.6-7.3	Low----------	0.15		
673D3, 673E3, 673F3----- Timula	0-34	10-18	1.30-1.60	0.6-2.0	0.20-0.24	6.1-7.8	Low----------	0.37	5-4	5
	34-60	10-18	1.40-1.60	0.6-2.0	0.18-0.20	7.4-8.4	Low----------	0.37		
763E3, 763F3----- Exette	0-8	18-27	1.30-1.35	0.6-2.0	0.21-0.23	6.6-7.3	Low----------	0.37	4	6
	8-46	20-27	1.35-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.43		
	46-60	15-20	1.45-1.50	0.6-2.0	0.20-0.22	6.6-7.8	Moderate-----	0.43		
767E3, 767F3----- Mula	0-23	12-18	1.30-1.60	0.6-2.0	0.20-0.24	6.6-8.4	Low----------	0.43	4	5
	23-60	12-18	1.30-1.60	0.6-2.0	0.20-0.24	6.6-8.4	Low----------	0.43		

See footnote at end of table.

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		Wind erodibility group
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				
814----------	0-21	18-27	1.30-1.40	0.6-2.0	0.20-0.22	5.1-7.8	Low----------	0.28	4	6
Rockton	21-34	25-35	1.40-1.55	0.6-2.0	0.17-0.19	5.1-7.8	Moderate-----	0.28		
	34-60	---	---	2.0-20	---	---	----------	----		
820, 820B--------	0-7	15-27	1.35-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	6
Dockery	7-60	15-27	1.35-1.45	0.6-2.0	0.12-0.20	5.6-7.3	Low----------	0.37		
826----------	0-23	15-22	1.35-1.45	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.28	5	5
Rowley	23-44	20-30	1.35-1.65	0.6-2.0	0.18-0.22	5.1-7.3	Low----------	0.43		
	44-57	10-20	1.55-1.65	0.6-2.0	0.12-0.16	5.1-7.3	Low----------	0.43		
	57-64	1-4	1.55-1.65	6.0-20	0.05-0.07	5.6-7.3	Low----------	0.15		
916B, 916C2,										
916D2----------	0-8	18-27	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Low----------	0.32	5	6
Downs	8-44	26-34	1.30-1.35	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.43		
	44-50	22-26	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.43		
	50-60	3-10	1.30-1.35	6.0-20	0.05-0.10	5.1-7.3	Low----------	0.17		
920B----------	0-19	27-35	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate-----	0.28	4	7
Tama	19-49	20-35	1.30-1.35	0.6-2.0	0.19-0.22	5.1-6.0	Moderate-----	0.43		
	49-60	3-10	1.30-1.35	6.0-20	0.05-0.10	5.1-7.3	Low----------	0.17		
920C2, 920D2-----	0-7	27-35	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate-----	0.32	5	7
Tama	7-19	27-35	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate-----	0.32		
	19-40	20-35	1.30-1.35	0.6-2.0	0.19-0.22	5.1-6.0	Moderate-----	0.43		
	40-45	15-20	1.30-1.35	2.0-6.0	0.11-0.17	5.1-6.5	Low----------	0.24		
	45-60	3-10	1.30-1.35	6.0-20	0.05-0.10	5.1-7.3	Low----------	0.17		
926----------	0-8	18-24	1.30-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	6
Canoe	8-23	20-27	1.35-1.40	0.6-2.0	0.20-0.22	5.1-6.0	Low----------	0.43		
	23-60	18-30	1.40-1.45	0.6-2.0	0.20-0.22	5.1-6.5	Moderate-----	0.43		
950, 950B--------	0-8	20-27	1.20-1.35	0.2-0.6	0.22-0.24	5.1-7.3	Low----------	0.37	3	6
Niota	8-60	38-60	1.40-1.60	<0.06	0.09-0.13	3.6-6.5	High---------	0.37		
960----------	0-22	20-27	1.45-1.55	0.6-2.0	0.20-0.22	5.1-7.3	Moderate-----	0.28	5	6
Shaffton	22-55	18-26	1.55-1.65	0.6-2.0	0.17-0.19	4.5-6.5	Moderate-----	0.28		
	55-60	2-6	1.65-1.75	>20	0.03-0.05	6.1-7.3	Low----------	0.15		
961----------	0-21	18-35	1.30-1.55	0.6-2.0	0.15-0.22	5.6-7.3	Moderate-----	0.28	5	6
Ambraw	21-27	30-42	1.30-1.55	0.2-0.6	0.08-0.19	5.1-7.3	Moderate-----	0.32		
	27-48	24-35	1.40-1.65	0.2-2.0	0.10-0.15	5.1-7.3	Moderate-----	0.32		
	48-60	18-30	1.35-1.65	0.2-2.0	0.11-0.22	6.1-8.4	Low----------	0.43		
977----------	0-23	15-22	1.35-1.60	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	5
Richwood	23-58	18-30	1.55-1.65	0.6-2.0	0.18-0.22	5.6-7.3	Moderate-----	0.43		
	58-65	1-4	1.55-1.65	6.0-20	0.05-0.07	6.1-7.3	Low----------	0.15		
1118----------	0-20	30-35	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	High---------	0.28	5	7
Garwin	20-60	27-35	1.28-1.35	0.6-2.0	0.18-0.20	6.1-7.3	High---------	0.28		
1119----------	0-15	28-30	1.30-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Moderate-----	0.28	5	7
Muscatine	15-47	30-35	1.28-1.35	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43		
	47-60	22-30	1.35-1.40	0.6-2.0	0.18-0.20	6.6-7.8	Moderate-----	0.43		
1539*:										
Ambraw----------	0-21	18-35	1.30-1.55	0.6-2.0	0.15-0.22	5.6-7.3	Moderate-----	0.28	5	6
	21-27	30-42	1.30-1.55	0.2-0.6	0.08-0.19	5.1-7.3	Moderate-----	0.32		
	27-48	24-35	1.40-1.65	0.2-2.0	0.10-0.15	5.1-7.3	Moderate-----	0.32		
	48-60	18-30	1.35-1.65	0.2-2.0	0.11-0.22	6.1-8.4	Low----------	0.43		

See footnote at end of table.

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		Wind erodibility group
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				
1539*:										
Perks	0-4	10-15	1.50-1.55	2.0-6.0	0.12-0.15	5.6-7.3	Low	0.24	5	3
	4-60	2-10	1.50-1.75	6.0-20	0.02-0.04	5.6-7.3	Low	0.15		
Lawson	0-8	10-27	1.20-1.55	0.6-2.0	0.22-0.24	6.1-7.8	Low	0.28	5	5
	8-35	10-30	1.20-1.55	0.6-2.0	0.18-0.22	6.1-7.8	Low	0.28		
	35-60	18-30	1.50-1.70	0.6-2.0	0.11-0.15	6.1-7.8	Moderate	0.43		
1730B*:										
Nodaway	0-8	18-27	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Low	0.32	5	6
	8-60	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate	0.43		
Perks	0-4	10-15	1.50-1.55	2.0-6.0	0.12-0.15	5.6-7.3	Low	0.24	5	3
	4-60	2-10	1.50-1.75	6.0-20	0.02-0.04	5.6-7.3	Low	0.15		
4000*.										
Urban land.										
4133*:										
Colo	0-31	27-36	1.28-1.32	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.28	5	7
	31-60	30-35	1.25-1.35	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.28		
Urban land.										
4162C*, 4162D*:										
Downs	0-8	18-26	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Low	0.32	5	6
	8-60	25-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate	0.45		
Urban land.										
4163E*:										
Fayette	0-11	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.32	5	6
	11-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.5	Moderate	0.43		
Urban land.										
4220*:										
Nodaway	0-8	18-27	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Low	0.32	5	6
	8-60	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate	0.43		
Urban land.										
4291*:										
Atterberry	0-8	20-26	1.35-1.55	0.6-2.0	0.22-0.25	5.6-7.3	Low	0.32	5	6
	8-60	25-35	1.40-1.60	0.6-2.0	0.14-0.24	5.1-7.3	Moderate	0.43		
Urban land.										
4977B*:										
Richwood	0-23	15-22	1.35-1.60	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.28	5	5
	23-58	18-30	1.55-1.65	0.6-2.0	0.18-0.22	5.6-7.3	Moderate	0.43		
	58-60	1-4	1.55-1.65	6.0-20	0.05-0.07	6.1-7.3	Low	0.15		
Urban land.										

See footnote at end of table.

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		Wind erodibility group
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				
5010*. Pits										
5030*. Pits										
5040*---------- Orthents, loamy	0-60	18-35	1.45-1.65	0.06-2.0	0.12-0.18	---	Moderate-----	0.32	5	6
	60-80	---	---	0.06-2.0	---	---	----------	----		
5080*. Orthents										

* See description of the map unit for composition and behavior characteristics of the map unit.

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	Hydrologic 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				
11B*: Colo	B/D	Occasional	Very brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
Ely	B	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
20C2, 20C3, 20D2, 20D3: Killduff	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
24D3, 24E2, 24E3: Shelby	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
41, 41B, 41C, 41D: Sparta	A	None	---	---	>6.0	---	---	>60	---	Low	Low	Moderate.
54: Zook	C/D	Occasional	Brief to long.	Feb-Nov	0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
63C, 63E: Chelsea	A	None	---	---	>6.0	---	---	>60	---	Low	Low	Low.
65E2, 65F, 65G: Lindley	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
83B, 83C2, 83D2, 83D3: Kenyon	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
84: Clyde	B/D	None	---	---	1.0-2.5	Apparent	Nov-Jul	>60	---	High	High	Low.
118: Garwin	B/D	None	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
119, 119B: Muscatine	B	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
120B, 120B2, 120C, 120C2, 120C3, 120D2, 120D3, 120E2, 120E3: Tama	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic 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				
133--Colo	B/D	Occasional	Very brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
139--Perks	A	Occasional	Very brief or brief.	Feb-Nov	>6.0	---	---	>60	---	Low	Low	Moderate.
151--Marshan	B/D	None	---	---	0.5-2.5	Apparent	Nov-Jul	>60	---	High	High	Moderate.
160--Walford	B/D	None	---	---	0-2.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
162B, 162C2, 162C3, 162D2, 162D3, 162E2, 162E3, 162F2--Downs	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
163B2, 163C, 163C2, 163C3, 163D, 163D2, 163D3, 163E, 163E2, 163E3, 163F, 163F2, 163F3, 163G--Fayette	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
174--Bolan	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
175, 175B, 175C--Dickinson	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	Moderate.
179D2, 179E2, 179E3, 179F2, 179F3--Gara	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
184--Klinger	B	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
220--Nodaway	B	Occasional	Very brief or brief.	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	High	Moderate	Low.
225--Lawler	B	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
254--Zook	C/D	Occasional	Brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic 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				
273C---------- Olmitz	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
284---------- Flagler	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
291---------- Atterberry	B	None--------	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
293C*, 293E*, 293F*:												
Chelsea---------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
Lamont----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
Fayette---------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
313G---------- Gosport	C	None--------	---	---	1.5-3.0	Perched	Nov-Jul	20-40	Soft	Moderate	High-----	High.
352B, 352C2------- Whittier	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
354*---------- Aquolls	---	None--------	---	---	+1-1	Apparent	Nov-Jul	>60	---	---	---	---
377B, 377C, 377C2- Dinsdale	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
382---------- Maxfield	B/D	None--------	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
420B---------- Tama	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
426B, 426C, 426C2, 426D2---------- Aredale	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
428B---------- Ely	B	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
430, 430B--------- Ackmore	B	Occasional	Very brief or brief.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Low.
442C2*, 442D2*, 442E2*:												
Tama----------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
Dickinson-------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic 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				
450B, 450C2---- Pillot	B	None----	---	---	>6.0	---	---	>60	---	High----	Moderate	Moderate.
484---- Lawson	C	Occasional	Brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High----	Moderate	Low.
499G---- Nordness	B	None----	---	---	>6.0	---	---	8-20	Hard	Low----	Low----	Low.
539---- Perks	A	Occasional	Very brief or brief.	Feb-Nov	>6.0	---	---	>60	---	Low----	Low----	Moderate.
673D3, 673E3, 673F3---- Timula	B	None----	---	---	>6.0	---	---	>60	---	High----	Low----	Low.
763E3, 763F3---- Exette	B	None----	---	---	>6.0	---	---	>60	---	High----	Low----	Low.
767E3, 767F3---- Mula	B	None----	---	---	>6.0	---	---	>60	---	High----	Low----	Low.
814---- Rockton	B	None----	---	---	>6.0	---	---	20-40	Soft	Moderate	Low----	Low.
820, 820B---- Dockery	C	Occasional	Brief to long.	Feb-Nov	2.0-3.5	Apparent	Nov-Jul	>60	---	High----	Moderate	Low.
826---- Rowley	C	Rare----	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	High----	High----	Moderate.
916B, 916C2, 916D2---- Downs	B	None----	---	---	>6.0	---	---	>60	---	High----	Moderate	Moderate.
920B, 920C2, 920D2---- Tama	B	None----	---	---	>6.0	---	---	>60	---	High----	Moderate	Moderate.
926---- Canoe	B	Rare----	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High----	High----	Moderate.
950, 950B---- Niota	D	None----	---	---	+.5-2.0	Perched	Mar-Jul	>60	---	High----	High----	High.
960---- Shaffton	B	Occasional	Brief----	Feb-Nov	2.0-4.0	Apparent	Nov-Jul	>60	---	Moderate	High----	High.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic 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				
961---------- Ambraw	B/D	Occasional	Brief to long.	Feb-Nov	0-2.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
977---------- Richwood	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Low.
1118---------- Garwin	B/D	None--------	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
1119---------- Muscatine	B	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
1539*:												
Ambraw----------	B/D	Frequent----	Brief to long.	Feb-Nov	0-2.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
Perks----------	A	Frequent----	Very brief or brief.	Feb-Nov	>6.0	---	---	>60	---	Low------	Low------	Moderate.
Lawson----------	C	Frequent----	Brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	Moderate	Low.
1730B*:												
Nodaway----------	B	Frequent----	Very brief or brief.	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	High-----	Moderate	Low.
Perks----------	A	Frequent----	Very brief or brief.	Feb-Nov	>6.0	---	---	>60	---	Low------	Low------	Moderate.
4000*. Urban land												
4133*:												
Colo----------	B/D	Occasional	Very brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
Urban land.												
4162C*, 4162D*:												
Downs----------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
Urban land.												
4163E*:												
Fayette----------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
Urban land.												

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic 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				
4220*:												
Nodaway	B	Occasional	Very brief or brief.	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	High	Moderate	Low.
Urban land.												
4291*:												
Atterberry	B	None	---	---	1.0-3.0	Apparent	Nov-Jun	>60	---	High	High	Moderate.
Urban land.												
4977B*:												
Richwood	B	None	---	---	>6.0	---	---	>60	---	High	Low	Low.
Urban land.												
5010*. Pits												
5030*. Pits												
5040*. Orthents, loamy	---	None	---	---	>6.0	---	---	>60	---	---	---	---
5080*. Orthents												

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Ackmore	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
Ambraw	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Aquolls	Mixed, mesic Haplaquolls
Aredale	Fine-loamy, mixed, mesic Typic Hapludolls
Atterberry	Fine-silty, mixed, mesic Udollic Ochraqualfs
Bolan	Coarse-loamy, mixed, mesic Typic Hapludolls
Canoe	Fine-silty, mixed, mesic Udollic Ochraqualfs
Chelsea	Mixed, mesic Alfic Udipsamments
Clyde	Fine-loamy, mixed, mesic Typic Haplaquolls
Colo	Fine-silty, mixed, mesic Cumulic Haplaquolls
Dickinson	Coarse-loamy, mixed, mesic Typic Hapludolls
Dinsdale	Fine-silty, mixed, mesic Typic Argiudolls
Dockery	Fine-silty, mixed, nonacid, mesic Aquic Udifluvents
Downs	Fine-silty, mixed, mesic Mollic Hapludalfs
Ely	Fine-silty, mixed, mesic Cumulic Hapludolls
Exette	Fine-silty, mixed, mesic Dystric Eutrochrepts
Fayette	Fine-silty, mixed, mesic Typic Hapludalfs
Flagler	Coarse-loamy, mixed, mesic Typic Hapludolls
Gara	Fine-loamy, mixed, mesic Mollic Hapludalfs
Garwin	Fine-silty, mixed, mesic Typic Haplaquolls
Gosport	Fine, illitic, mesic Typic Dystrochrepts
Kenyon	Fine-loamy, mixed, mesic Typic Hapludolls
Killduff	Fine-silty, mixed, mesic Dystric Eutrochrepts
Klinger	Fine-silty, mixed, mesic Aquic Hapludolls
Lamont	Coarse-loamy, mixed, mesic Typic Hapludalfs
Lawler	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Aquic Hapludolls
Lawson	Fine-silty, mixed, mesic Cumulic Hapludolls
Lindley	Fine-loamy, mixed, mesic Typic Hapludalfs
Marshan	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Haplaquolls
Maxfield	Fine-silty, mixed, mesic Typic Haplaquolls
Mula	Coarse-silty, mixed (calcareous), mesic Typic Udorthents
Muscatine	Fine-silty, mixed, mesic Aquic Hapludolls
*Niota	Fine, mixed, mesic Mollic Albaqualfs
Nodaway	Fine-silty, mixed, nonacid, mesic Mollic Udifluvents
Nordness	Loamy, mixed, mesic Lithic Hapludalfs
Olmitz	Fine-loamy, mixed, mesic Cumulic Hapludolls
Orthents	Loamy, mixed, mesic Typic Udorthents
Perks	Mixed, mesic Typic Udipsamments
Pillot	Fine-silty over sandy or sandy-skeletal, mixed, mesic Typic Argiudolls
Richwood	Fine-silty, mixed, mesic Typic Argiudolls
Rockton	Fine-loamy, mixed, mesic Typic Argiudolls
Rowley	Fine-silty, mixed, mesic Aquic Argiudolls
Shaffton	Fine-loamy, mixed, mesic Fluvaquentic Hapludolls
*Shelby	Fine-loamy, mixed, mesic Typic Argiudolls
Sparta	Sandy, mixed, mesic Entic Hapludolls
Tama	Fine-silty, mixed, mesic Typic Argiudolls
Timula	Coarse-silty, mixed, mesic Typic Eutrochrepts
Walford	Fine-silty, mixed, mesic Mollic Ochraqualfs
Whittier	Fine-silty over sandy or sandy-skeletal, mixed, mesic Mollic Hapludalfs
Zook	Fine, montmorillonitic, mesic Cumulic Haplaquolls

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