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 Tama County, Iowa

How To Use This Soil Survey

General Soil Map

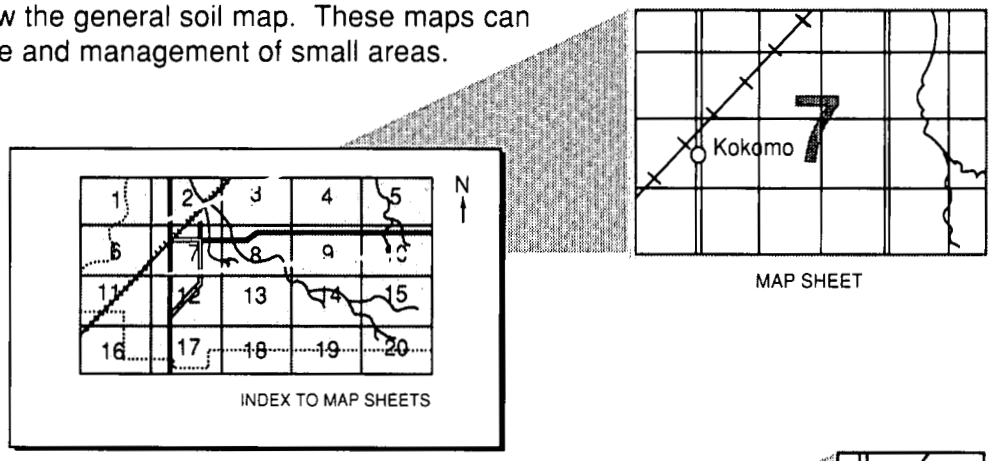
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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.

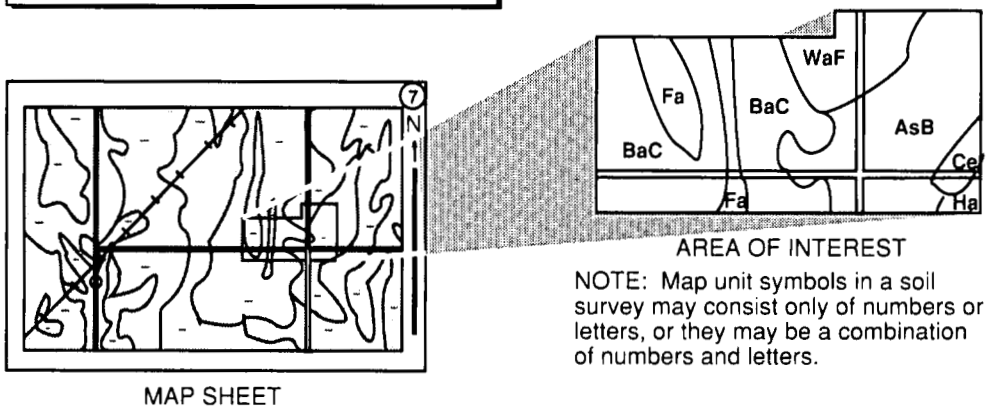
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



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 1988. Soil names and descriptions were approved in 1989. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1988. 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 Tama County Soil and Water Conservation District. Funds appropriated by Tama County were used to defray part of the cost of the survey.

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

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

Cover: Alfalfa hay in an area of the Tama association in the county. Corn and soybeans are planted in this area in alternate seasons.

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Issued October 1995

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Summary of Tables

Preface

This soil survey contains information that can be used in land-planning programs in Tama 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.

Soil Survey of Tama County, Iowa

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Fieldwork by Gary L. Hillmer, Kermit Voy, Robin J. Wisner, Allan W. Younk, 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

TAMA COUNTY is in east-central Iowa (fig. 1). It has an area of 462,300 acres, or about 720 square miles. Toledo, the county seat, is in the southeastern part of the county, about 60 miles northeast of Des Moines.

Enterprises in the county are chiefly agricultural. The main crops are corn and soybeans. Generally, a larger acreage is planted to corn than to soybeans, but the acreage of soybeans has been progressively increasing so that it is almost equal to that of corn. Raising beef cattle and hogs is an important, although not extensive, agricultural enterprise in the county.

The Iowa River, one of the main rivers in Iowa, crosses the southern part of the county. It enters the western part of the county and runs in a southeasterly direction to the southeast corner. It is of medium gradient and is subject to flooding of low velocity and short duration in the spring and after periods of heavy rainfall. Damage by flooding is chiefly to the agricultural land in the county. Loess hills rise quite abruptly to a height of 150 to 200 feet above the river.

The first soil survey of Tama County was published in 1905 *(4)*. A later soil survey of the county was published in 1950 *(1)*. This soil survey provides additional information and larger maps, which show the soils in greater detail.

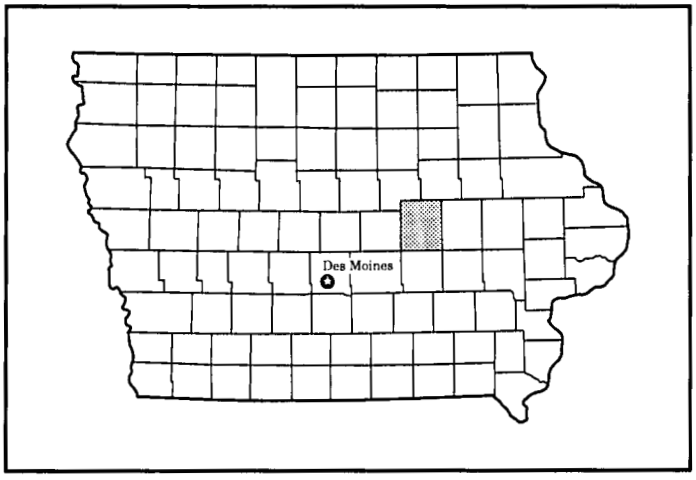

Figure 1.—Location of Tama County in Iowa.

General Nature of the County

This section provides information about the transportation facilities, industry, recreation, history and development, farming, relief and drainage, and climate in the county.

Transportation Facilities

U.S. Highway 30, which runs east and west, and U.S. Highway 63, which runs north and south, intersect at the cities of Tama and Toledo. U.S. Highway 30 also intersects State Highway 21, which runs north and south along the eastern border of the county, in the southeast corner. These routes are connected to all

parts of the county by paved or crushed rock roads. Most of the farmsteads in the county are along all-weather roads.

The city of Tama, in the south-central part of the county, is on the mainline of a railroad. Scheduled airline transportation is available at Cedar Rapids, Des Moines, and Waterloo, all of which are within 50 to 70 miles of the county. Toledo and Tama each have a small municipal airport. Bus transportation is available on U.S. Highway 30, and bus connections for north-south routes are available at Cedar Rapids and Des Moines. Motor freight lines serve trading centers in the county.

Industry

Tama County is primarily rural, but a few industries are in the county. Most of the industries are closely dependent on the agricultural economy of the county. A large meat-packing plant and a paper-recycling plant are located in the town of Tama. Several lumber mills, which harvest timber from the relatively large forested areas along the Iowa River, are in the county. Several seed corn enterprises also are in the county, including a large operation in Toledo.

Recreation

Many parks have been established throughout the county. The long, narrow, deep valleys and the side slopes and flood plains of the valleys are excellent sites for large earthen dams that form lakes. The largest dam is 4 miles south of Gladbrook at Union Grove State Park.

Rivers and creeks in rural areas of the county provide opportunities for outdoor recreational activities, such as hunting, fishing, and fur trapping. The county is known for its large number of upland game birds, such as pheasant and hungarian partridge. Many areas along the creeks and upland waterways provide birds with nests, food, and winter shelter. Many small ponds are stocked with smallmouth bass and other game fish. Many other kinds of wildlife in the county provide recreational opportunities. White-tailed deer are plentiful, and hunting them is a popular recreational activity in the forested, steep and very steep areas along the Iowa River.

History and Development

Tama County was primarily settled in the period 1850-80. The most rapid increase in population followed the completion of the railroad in 1862. In 1850, the population of Tama County was eight according to the first U.S. census taken in the county. It increased to about 21,585 by 1880.

The first permanent settlers in the county, William Riley Vandorin, his wife, Rachel, and their two children, arrived in 1849. Vandorin and his family settled in section 22 of York Township along the lowlands of Salt Creek. In 1851, they were forced to move to the bluffs in the uplands after the area received heavy rains. Settlement of the county progressed faster in the southern part of the county along the Iowa River than in the northern part. Timber, which was necessary for fuel and shelter, was abundant on the steep bluffs along the river.

Tama County was named after the wife of Indian Chief Poweshiek. In the Native American language, the name signifies beautiful, pleasant, and lovely. Poweshiek was a chief of the Sac and Fox tribe in the area at the time of early settlement.

Tama County was established in 1853 by court order. The district court appointed a trustee from Benton, Poweshiek, and Marshall Counties to hold elections. The first election was held on the first Monday of April in 1853. The purpose of the election was to organize the county into civil townships. The next election was held a month later to elect county officials. One of the first duties of the county commissioners was to select the county seat.

The county commissioners first selected a site in Howard Township near Bruner Mill, which was the most settled and populated area in the county at the time, as the county seat; however, they could not secure a suitable site with enough land from the local people at Bruner Mill to develop the county seat. Subsequently, people in the Toledo area offered to donate an 80-acre area. The commissioners accepted this offer.

The county commissioners also were granted the power to select a name for the county seat. They agreed that the oldest person present at the selection of the site be given the honor of naming the county seat. Adam Zehrung, who was the oldest person present and who once resided in Toledo, Ohio, suggested that the county seat be named after Toledo. The county seat has remained in Toledo since that time.

Farming

Farms in the county have been increasing in size and decreasing in number. In 1977, about 1,600 farms were in the county, and in 1987, only 1,440 farms were in the county. During this time, the acreage per farm increased from 274 to 315 acres. In 1987, the average acreage of farms in the state was 313 acres per farm.

In 1986, the average value of farmland was $828 per acre. In 1987, it was $913 per acre, or an increase of more than 10 percent over the 1986 value.

Farm production in the county generally is a diversified system of cash grain and livestock. The most important cash crop is corn. In 1987, about 172,000 acres in Tama County was planted to corn. Some corn is planted for seed production each year. In 1985, an estimated 40,000 acres was planted to seed corn. Soybeans also are an important cash crop. In 1987, about 113,000 acres was planted to soybeans. Most of the corn and soybeans are sold to local elevators. They eventually are sold or moved to the Mississippi River for shipment to larger grain terminals.

The most extensively raised and marketed livestock in the county are beef cattle and hogs. Most of the cattle are locally raised and fed grain until they are sent to market. Several hundred thousand hogs are raised and marketed each year. About 120,000 acres of pasture and hayland is in the county.

Relief and Drainage

Most of Tama County is on dissected uplands. About three-fourths of the county is drained by the Iowa River and its principal tributaries—Deer Creek, Richland Creek, and Salt Creek. Wolf Creek, in the northern part of the county, drains the rest of the county. It runs from Gladbrook to about 3 miles south of the northeast corner of the county. The entire drainage system eventually empties into the Mississippi River.

The highest surface elevation in the county is about 1,060 feet above sea level. It is in the northwest corner of the county. The lowest elevation is about 770 feet above sea level. It is in the southeast corner of the county where the Iowa River leaves the county.

Generally, the topography is nearly level to rolling in the northern half of the county and gently rolling to very steep in the southern half, along the Iowa River and its tributaries. Some small areas between the rivers and creeks on the major divides are level or nearly level. Pahas, or prominent elongated ridges or elliptical mounds that are 50 to 75 feet above the nearly level plain, are in the northern part of the county. They are oriented in a northwest-southeast direction. The word "paha" means small hill in some Native American languages.

Climate

Tama 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 chiefly showers, which often are 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 Toledo, Iowa, in the period 1951 to 1987. 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 21 degrees F and the average daily minimum temperature is 12 degrees. The lowest temperature on record, which occurred at Toledo on March 1, 1962, is -31 degrees. In summer, the average temperature is 71 degrees and the average daily maximum temperature is 83 degrees. The highest recorded temperature, which occurred on August 17, 1983, is 102 degrees.

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

The total annual precipitation is about 35 inches. Of this, 25 inches, or more than 70 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 21 inches. The heaviest 1-day rainfall during the period of record was 5.85 inches at Toledo on August 16, 1977. Thunderstorms occur on about 42 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 18 inches. On the average, 34 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 13 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.

How This Survey Was Made

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

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

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

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

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

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

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

Map Unit Composition

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

areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

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

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

General Soil Map Units

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

1. Tama Association

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

This association consists of soils on broad, convex ridgetops and long, convex side slopes. The landscape is undulating to hilly. Slopes range from 2 to 18 percent.

This association makes up about 30 percent of the county. It is about 60 percent Tama soils and 40 percent soils of minor extent.

Tama soils are well drained. They are on convex ridgetops and long, convex, dissected side slopes. Typically, the surface layer is very dark brown silty clay loam about 6 inches thick. The subsurface layer is very dark brown silty clay loam about 8 inches thick. The subsoil is friable silty clay loam about 31 inches thick. The upper part is very dark grayish brown and brown, the next part is brown, and the lower part is dark yellowish brown and yellowish brown and is mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled silty clay loam.

Minor in this association are the Colo, Dinsdale, Ely, Killduff, Muscatine, and Shelby soils. Colo and Ely soils formed in silty alluvium. Colo soils are poorly drained and are in narrow upland drainageways and on bottom land. Ely soils are somewhat poorly drained and are on foot slopes and in narrow upland drainageways. Dinsdale soils formed in loess and in the underlying glacial till. They are well drained and are on the lower part of convex side slopes. Killduff soils formed in loess and in the underlying deoxidized loess. They are in coves at the head of drainageways. Muscatine soils formed in loess. They are somewhat poorly drained and are on board ridgetops. Shelby soils are on the lower, steeper part of convex side slopes.

The Tama soils are well suited or moderately well suited to corn, soybeans, oats, and hay. Available water capacity is high or very high. The content of organic matter is moderate or high. The soils in the steeper areas are suited to cultivated crops if the crops are only grown occasionally and if they are grown in rotation with hay or pasture. The main management concerns are controlling erosion and maintaining tilth and fertility.

2. Muscatine-Tama-Garwin Association

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

This association consists of soils on broad, convex ridgetops and side slopes. The landscape is nearly level to gently rolling. Slopes range from 0 to 9 percent.

This association makes up about 9 percent of the county. It is about 44 percent Muscatine soils, 21 percent Tama soils, 19 percent Garwin soils, and 16 percent soils of minor extent (fig. 2).

Muscatine soils are somewhat poorly drained. They are on nearly level, broad drainage divides and in gently sloping areas at the head of drainageways. Tama soils are well drained. They are on nearly level drainage divides and moderately sloping, convex side slopes. Garwin soils are poorly drained. They are on nearly level, broad drainage divides and in narrow upland waterways.

Typically, the surface layer of the Muscatine soils is black silty clay loam about 9 inches thick. The subsurface layer is silty clay loam about 13 inches thick. The upper part is very dark brown, and the lower part is very dark grayish brown and dark brown. The

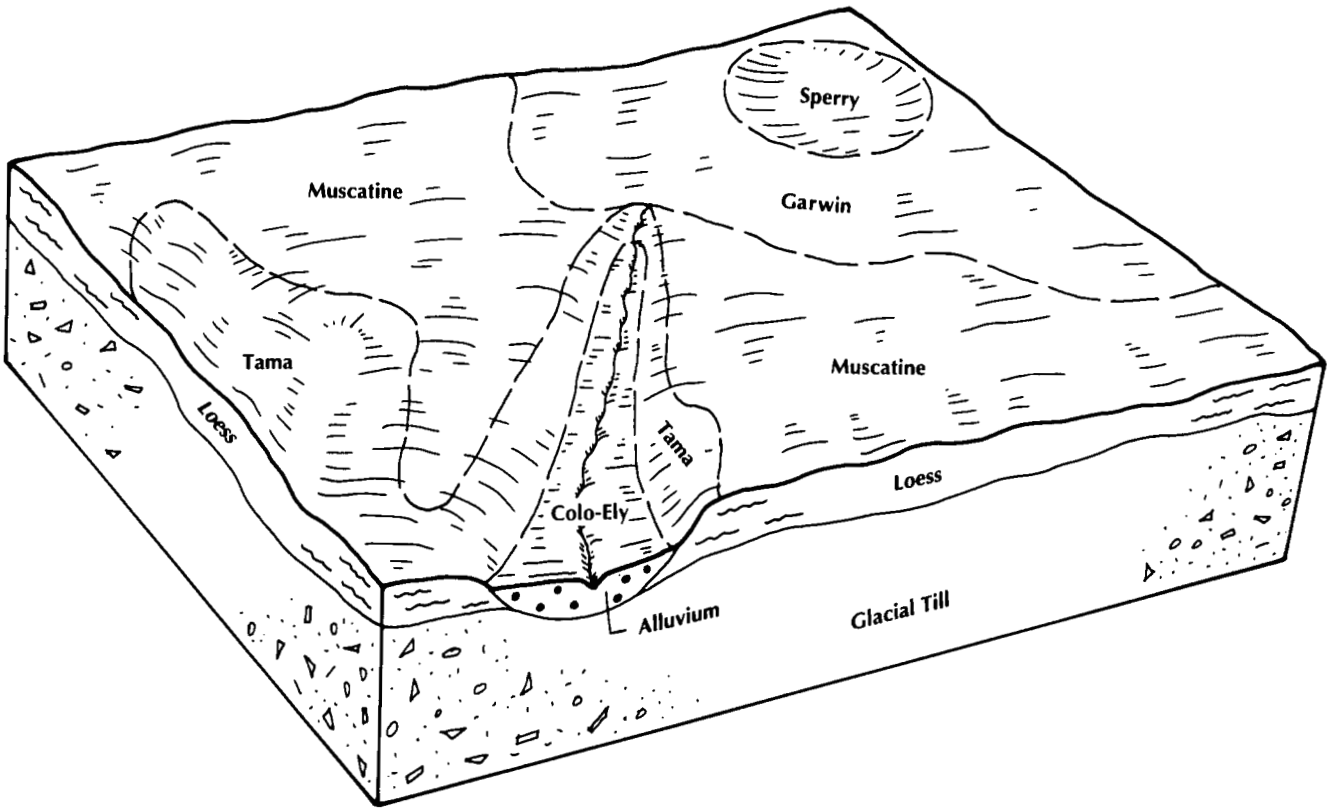

Figure 2.—Typical pattern of soils and parent material in the Muscatine-Tama-Garwin association.

subsoil is mottled, friable silty clay loam about 25 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.

Typically, the surface layer of the Tama soils is very dark brown silty clay loam about 6 inches thick. The subsurface layer is very dark brown silty clay loam about 8 inches thick. The subsoil is friable silty clay loam about 31 inches thick. The upper part is very dark grayish brown and brown, the next part is brown, and the lower part is dark yellowish brown and yellowish brown and is mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled silty clay loam.

Typically, the surface layer of the Garwin soils is black silty clay loam about 8 inches thick. The subsurface layer is black and very dark gray silty clay loam about 15 inches thick. The subsoil is mottled silty clay loam about 29 inches thick. The upper part is dark gray and firm, the next part is olive gray and firm, and the lower part is olive gray and friable. The substratum to a depth of about 60 inches is olive gray, mottled silt loam.

Minor in this association are the Colo, Ely, Sawmill, and Sperry soils. Colo and Ely soils formed in silty alluvium. Colo soils are poorly drained, and Ely soils are somewhat poorly drained. Sawmill soils formed in silty alluvium and loess. They are poorly drained. Colo, Ely, and Sawmill soils are in narrow upland drainageways. Sperry soils are very poorly drained and are in depressions on broad upland divides. They formed in loess.

The soils in this association are well suited to corn, soybeans, oats, and hay. Available water capacity is high or very high. The content of organic matter in the surface layer is moderate or high. The main management concerns are the hazard of erosion in the moderately sloping areas and a seasonal high water table in the poorly drained soils.

3. Dinsdale-Tama Association

Gently sloping to strongly sloping, well drained, silty soils formed in loess and in the underlying glacial till; on uplands

This association consists of soils on broad to narrow, convex ridgetops and side slopes. The landscape is

undulating to rolling. Slopes range from 2 to 14 percent.

This association makes up about 16 percent of the county. It is about 66 percent Dinsdale soils, 16 percent Tama soils, and 18 percent soils of minor extent (fig. 3).

Dinsdale soils are well drained. They generally are on narrow, convex ridgetops and long side slopes. Tama soils are well drained. They are on broad, convex ridgetops.

Typically, the surface layer of the Dinsdale soils is very dark brown silty clay loam about 7 inches thick. It is mixed with some streaks and pockets of dark yellowish brown subsoil material. The subsoil is about 30 inches thick. The upper part is dark yellowish brown, friable silty clay loam, and the lower part is yellowish brown, mottled, firm loam. The substratum to a depth of about 60 inches is yellowish brown, mottled loam.

Typically, the surface layer of the Tama soils is very dark brown silty clay loam about 6 inches thick. The subsurface layer is very dark brown silty clay loam about 8 inches thick. The subsoil is friable silty clay loam about 31 inches thick. The upper part is very dark grayish brown and brown, the next part is brown, and the lower part is dark yellowish brown and yellowish brown and is mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled silty clay loam.

Minor in this association are the Bolan, Colo, Ely, Liscomb, and Muscatine soils. Bolan soils formed in sandy eolian material. They are well drained and are on ridgetops and side slopes. Colo and Ely soils formed in silty alluvium. Colo soils are poorly drained and are in narrow upland drainageways and on bottom land. Ely soils are somewhat poorly drained and are on foot slopes and in narrow upland drainageways. Liscomb soils formed in glacial till. They are well drained and are on the steep and lower parts of side slopes. Muscatine soils are somewhat poorly drained and are at the head of drainageways.

The soils in this association are well suited or moderately well suited to corn, soybeans, oats, and

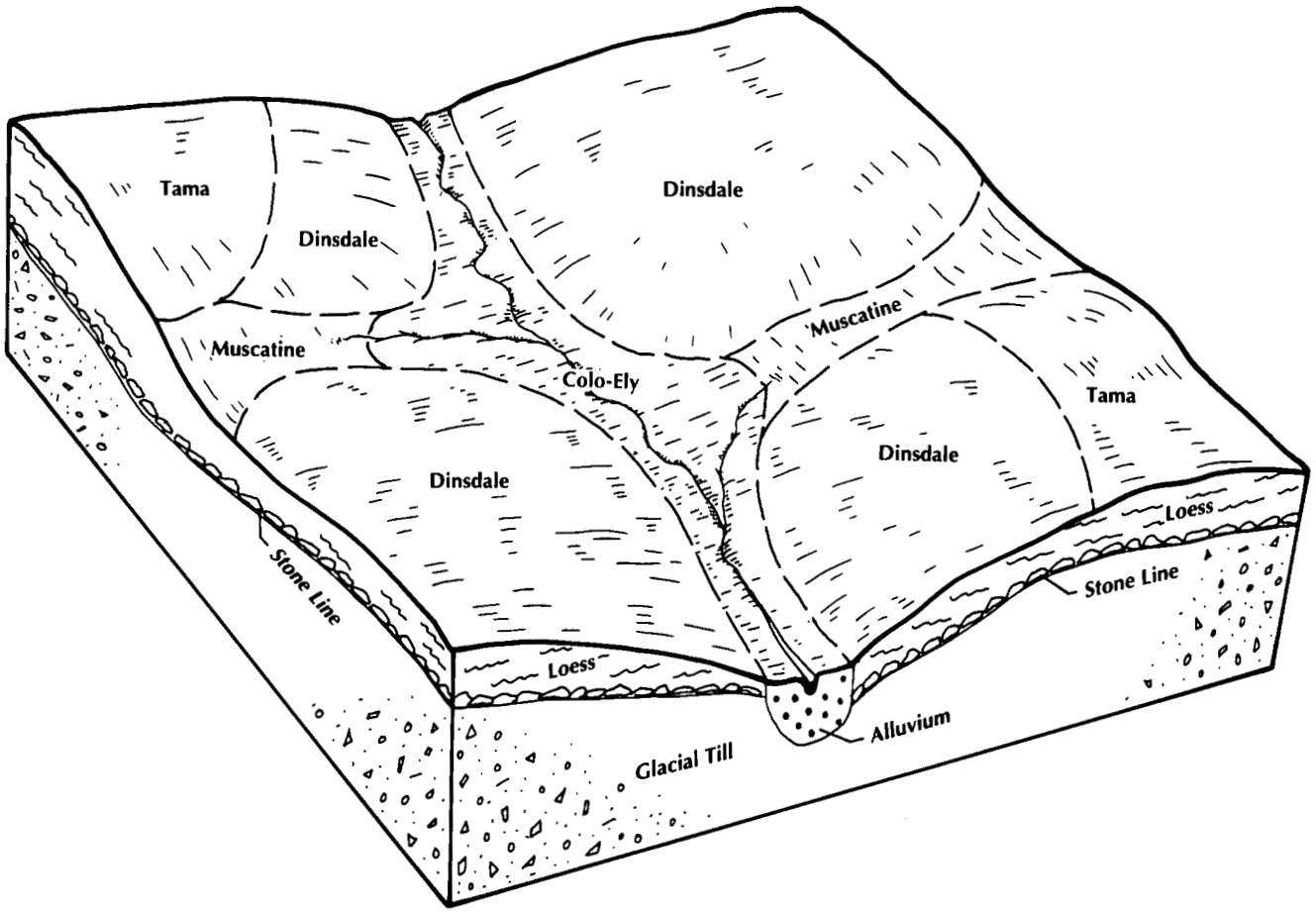

Figure 3.—Typical pattern of soils and parent material in the Dinsdale-Tama association.

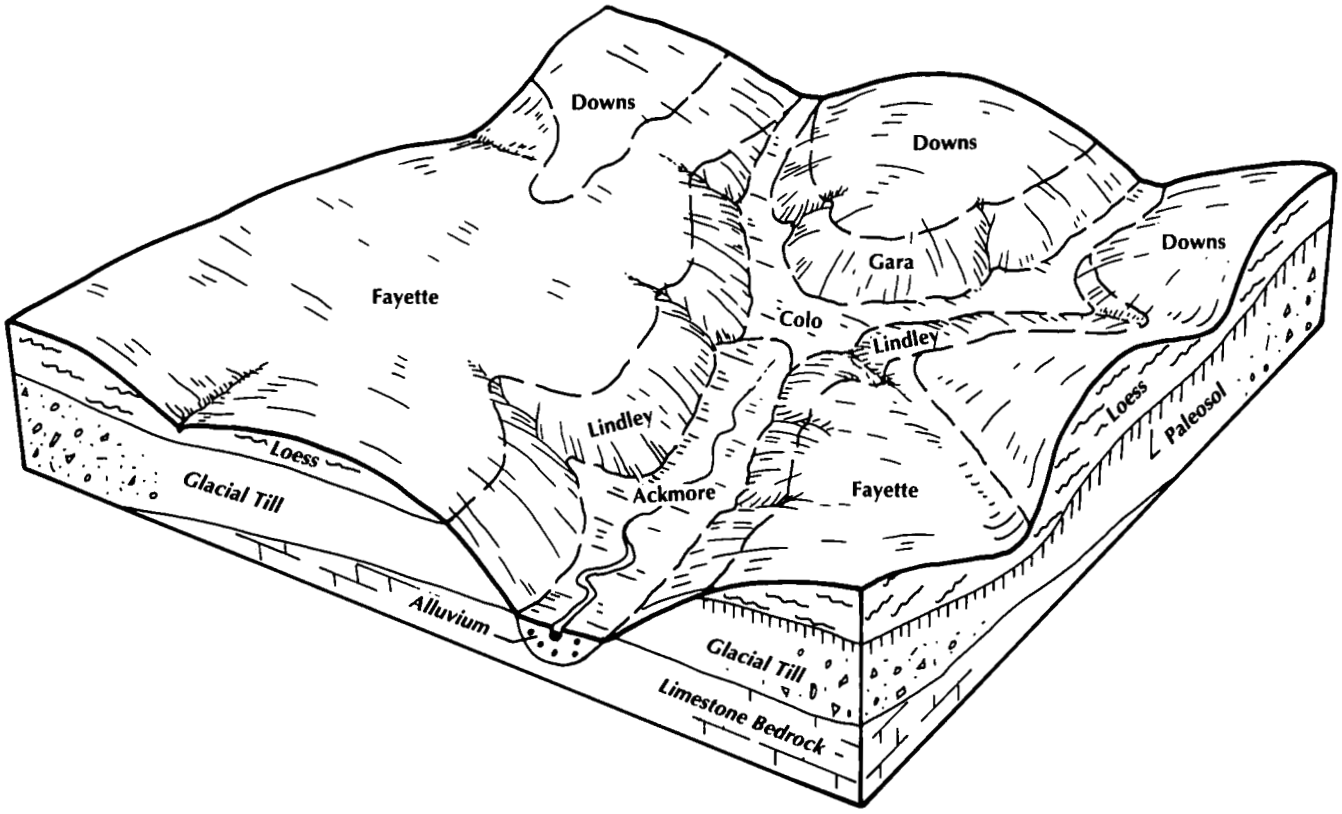

Figure 4.—Typical pattern of soils and parent material in the Fayette-Downs association.

hay. Available water capacity is high or very high. The content of organic matter is moderate or high. The steeper soils are suited to cultivated crops that are occasionally grown in rotation with hay or pasture. The main management concerns are controlling erosion and maintaining tilth and fertility.

4. Fayette-Downs Association

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

This association consists of soils on broad to narrow, convex ridgetops and long, convex side slopes. The side slopes are dissected by numerous waterways. The landscape is undulating to very steep. Slopes range from 2 to 40 percent.

This association makes up about 26 percent of the county. It is about 46 percent Fayette soils, 22 percent Downs soils, and 32 percent soils of minor extent (fig. 4).

Fayette soils are well drained. They are on gently sloping to very steep slopes and on narrow, convex ridgetops and dissected side slopes. Downs soils are well drained. They are on gently sloping to steep slopes and on broad, convex ridgetops and side slopes.

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

Typically, the surface layer of the Downs soils is very dark grayish brown silt loam about 7 inches thick. It is mixed with some streaks and pockets of brown subsoil material. The subsoil is friable and is about 42 inches thick. The upper part is brown silt loam, the next part is dark yellowish brown silty clay loam, and the lower part is yellowish brown, mottled silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam.

Minor in this association are the Ackmore, Colo, Gara, Lindley, and Timula soils. Ackmore and Colo soils formed in silty alluvium. Ackmore soils are on alluvial

fans and in narrow drainageways on uplands. They are somewhat poorly drained. Colo soils are in narrow drainageways on uplands, on broad flood plains, and on bottom land. They are poorly drained. Gara and Lindley soils formed in glacial till. They are on the lower part of dissected side slopes. Timula soils formed in silty loess. They have a calcareous, gray, deoxidized subsoil and are well drained. They are in coves at the head of drainageways.

The soils in this association generally are well suited or moderately well suited to corn, soybeans, oats, and hay. In steep and very steep areas, however, they are unsuited to these crops but are well suited to pasture and trees. Available water capacity is high. The content of organic matter ranges from moderate to low. The main management concerns generally are controlling erosion, preventing the formation of gullies, and maintaining fertility. In the steep and very steep areas, however, pasture and timber management are the major management concerns.

5. Chelsea-Fayette Association

Moderately sloping to very steep, excessively drained and well drained, sandy and silty soils formed in sandy eolian material and loess; on uplands

This association consists of soils on narrow, convex ridgetops and long, dissected, convex side slopes. The landscape is gently rolling to very steep. Slopes range from 5 to 40 percent.

This association makes up about 2 percent of the county. It is about 42 percent Chelsea soils, 30 percent Fayette soils, and 28 percent soils of minor extent.

Chelsea soils are excessively drained. They generally are on narrow, convex ridgetops and dissected side slopes. In some areas they are on conical mounds or long, narrow ridges that are oriented in a northwest to southeast direction. Fayette soils are well drained. They are on narrow, convex ridgetops and dissected side slopes.

Typically, the surface layer of the Chelsea soils is very dark gray loamy fine sand about 4 inches thick. The subsurface layer is about 38 inches thick. The upper part is brown loamy fine sand, the next part is yellowish brown fine sand, and the lower part is brownish yellow, mottled fine sand. The subsoil to a depth of about 60 inches is light yellowish brown, loose sand that has lamellae of strong brown sandy loam.

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

Minor in this association are the Ackmore, Colo, Lamont, and Lindley soils. Ackmore and Colo soils formed in silty alluvium. They are somewhat poorly drained or poorly drained and are in narrow upland drainageways and on alluvial fans. Lamont soils formed in sandy eolian material, are loamy fine sand, and are well drained. They are on convex side slopes and ridgetops. Lindley soils formed in glacial till. They are moderately well drained and are on the lower part of dissected, convex side slopes.

Fayette soils are moderately well suited to corn, soybeans, and oats. Chelsea soils are unsuited to these crops. Fayette and Chelsea soils are well suited or moderately well suited to pasture and trees. Available water capacity ranges from high to low. The content of organic matter ranges from moderately low to very low. The main management concerns generally are controlling water erosion, preventing the formation of gullies, and maintaining fertility. In the steep and very steep areas, however, pasture and timber management are the major management concerns.

6. Colo-Wiota-Nevin Association

Nearly level or gently sloping, well drained, somewhat poorly drained, and poorly drained, silty soils formed in alluvium; on flood plains and terraces

This association consists of soils on narrow and broad flood plains and on broad terraces that are about 2 to 20 feet above the flood plain. The landscape is nearly level or undulating. Slopes range from 0 to 5 percent.

This association makes up about 9 percent of the county. It is about 46 percent Colo soils, 20 percent Wiota soils, 18 percent Nevin soils, and 16 percent soils of minor extent.

Colo soils are poorly drained. They are on nearly level flood plains next to stream channels. Wiota soils are well drained. They are on nearly level or undulating, low stream terraces. Nevin soils are somewhat poorly drained. They are on nearly level, low stream terraces.

Typically, the surface layer of the Colo soils is black silty clay loam about 8 inches thick. The subsurface layer is black silty clay loam about 26 inches thick. The subsoil is friable silty clay loam about 18 inches thick. The upper part is very dark gray, and the lower part is dark gray. The substratum to a depth of about 60 inches is dark gray, mottled silt loam.

Typically, the surface layer of the Wiota soils is very dark brown silt loam about 7 inches thick. The subsurface layer is very dark brown silt loam about 11

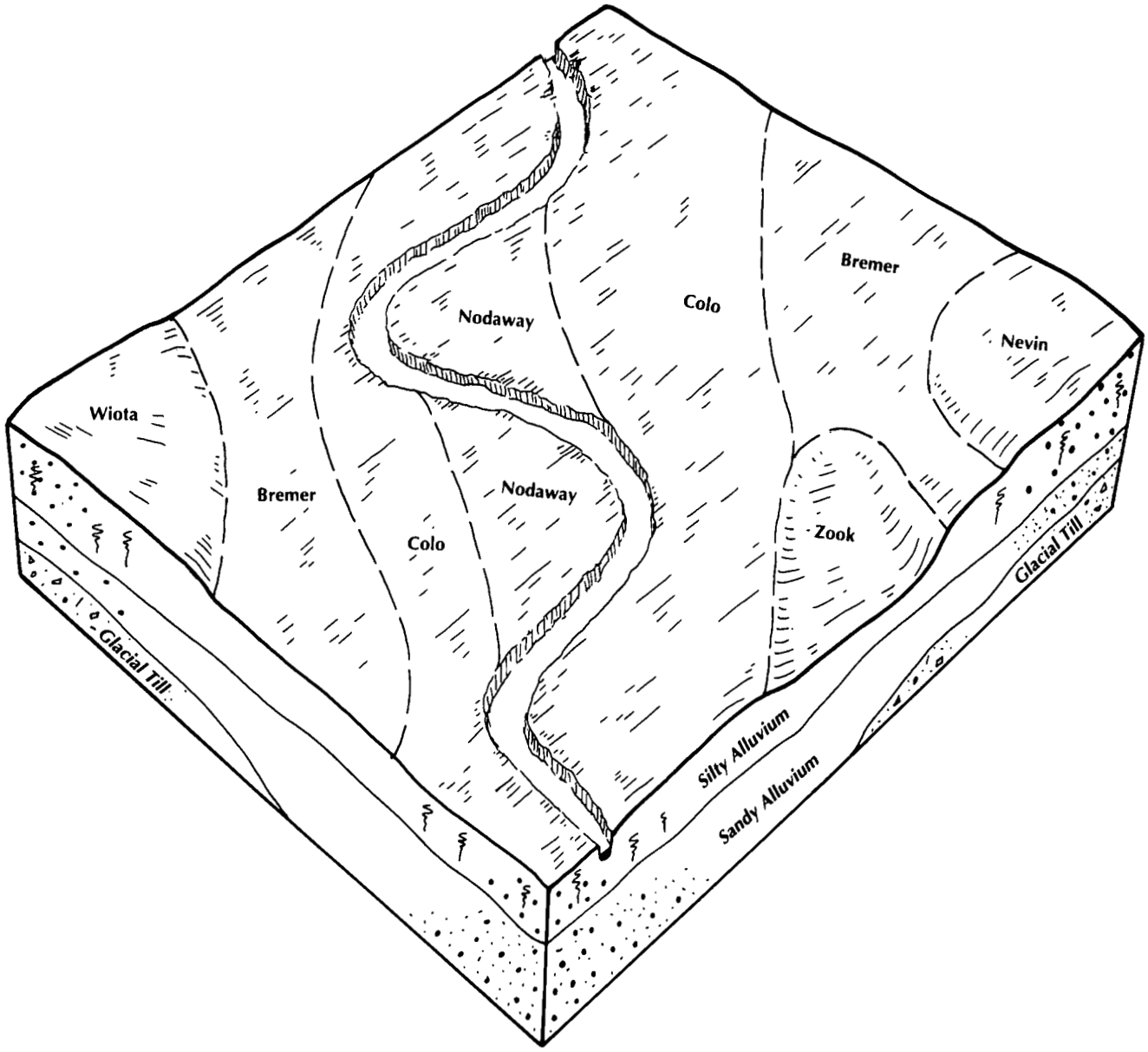

Figure 5.—Typical pattern of soils and parent material in the Colo-Bremer-Nodaway association.

inches thick. The subsoil is friable silty clay loam about 31 inches thick. The upper part is dark brown, the next part is brown and dark yellowish brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is brown, mottled silt loam.

Typically, the surface layer of the Nevin soils is black silty clay loam about 7 inches thick. The subsurface layer is silty clay loam about 15 inches thick. The upper part is black, and the lower part is very dark brown. The subsoil is mottled, friable silty clay loam about 24 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 silty clay loam.

Minor in this association are the Ackmore, Bremer, Humeston, and Waukegan soils. Ackmore soils formed in silty alluvium of recently deposited overwash and a buried layer of surface soil. They are poorly drained and are on flood plains. Bremer and Humeston soils formed in silty alluvium on low stream terraces. Bremer soils are poorly drained and are nearly level. Humeston soils are very poorly drained and are in depressions.

Waukegan soils are well drained and are on gently rolling terrace escarpments and undulating or nearly level stream terraces. They formed in silty alluvium and the underlying sand and gravel.

The soils in this association are well suited to corn, soybeans, oats, and hay. Available water capacity is high. The content of organic matter in the surface layer also is high. The well drained soils on the higher part of terraces are suited to cultivated crops. The hazard of erosion is minimal in these areas. A tile drainage system and diversion terraces lower the seasonal high water table and help to overcome the flooding on soils on bottom land and on the lower part of terraces. The main management concerns are flooding and the seasonal high water table.

7. Colo-Bremer-Nodaway Association

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

This association consists of soils on broad, channeled flood plains. The landscape is nearly level. The soils in this association are subject to flooding. Slopes range from 0 to 2 percent.

This association makes up about 8 percent of the county. It is about 45 percent Colo soils, 24 percent Bremer soils, 12 percent Nodaway soils, and 19 percent soils of minor extent (fig. 5).

Colo and Bremer soils are poorly drained. Colo soils are on flood plains away from the stream channel. Bremer soils are on terraces. Nodaway soils are moderately well drained. They are on flood plains close to the stream channel.

Typically, the surface layer of the Colo soils is black silty clay loam about 8 inches thick. The subsurface layer is black silty clay loam about 26 inches thick. The subsoil is friable silty clay loam about 18 inches thick. The upper part is very dark gray, and the lower part is dark gray. The substratum to a depth of about 60 inches is dark gray, mottled silt loam.

Typically, the surface layer of the Bremer soils is black silty clay loam about 8 inches thick. The subsurface layer is black silty clay loam about 10 inches thick. The subsoil is firm and about 23 inches thick. The upper part is very dark gray silty clay, and the lower part is dark gray silty clay loam. The substratum to a depth of about 60 inches is grayish brown, mottled silty clay loam.

Typically, the surface layer of the Nodaway soils is very dark grayish brown silt loam about 7 inches thick. The substratum is stratified silt loam about 47 inches thick. The upper part is dark grayish brown, very dark grayish brown, and grayish brown, and the lower part is grayish brown and dark grayish brown and is mottled. Below the substratum to a depth of about 60 inches is an older, buried surface layer of black, mottled silt loam.

Minor in this association are the Nevin, Wiota, and Zook soils. Nevin soils formed in silty alluvium. They are somewhat poorly drained and are on nearly level, low stream terraces. Wiota soils are well drained. Zook soils formed in silty alluvium that has a content of clay of more than 38 percent. They are on nearly level bottom land and are poorly drained.

Colo and Nodaway soils are unsuited to corn, soybeans, oats, and hay because of the flooding and a seasonal high water table and because many oxbows and old stream channels are filled with water most of the year. They are moderately well suited to pasture and timber production. Bremer soils are well suited to corn, soybeans, oats, and hay. They have a seasonal high water table during most of the year. Grazing and timber harvesting should be deferred when the soils are flooded or wet.

Detailed Soil Map Units

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

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

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

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

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, 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. Chelsea-Lamont-Fayette complex, 9 to 14 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.

5B—Ackmore-Colo complex, 2 to 5 percent slopes. These gently sloping, somewhat poorly drained and poorly drained soils are on foot slopes, alluvial fans, and narrow flood plains in upland drainageways. They are subject to flooding. Areas range from 10 to more than 100 acres in size. They are long and narrow or irregularly shaped. They are about 50 percent Ackmore soil and 40 percent Colo soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Ackmore soil is very dark grayish brown silt loam about 7 inches thick. The substratum is very dark grayish brown and very dark gray, mottled, stratified silt loam about 20 inches thick. Below this to a depth of about 60 inches is a buried layer of silty clay loam. It is black in the upper part and very dark gray and mottled in the lower part.

Typically, the surface layer of the Colo soil is very dark grayish brown silt loam about 7 inches thick. The subsurface layer is about 40 inches thick. The upper part is very dark grayish brown silt loam, and the lower part is black silty clay loam. The subsoil is dark gray, mottled, friable silty clay loam about 10 inches thick. The substratum to a depth of about 60 inches is dark gray, mottled silt loam.

Included with these soils in mapping are small areas of the somewhat poorly drained Ely and the well drained Judson soils. Ely soils have an olive brown subsoil. Judson soils have a brown subsoil. Ely and Judson soils are in the higher positions on foot slopes. They make up about 10 percent of the unit.

Permeability of these Ackmore and Colo soils is moderate, and runoff is slow. Available water capacity is very high in the Ackmore soil and high in the Colo soil. Both soils have a seasonal high water table. The content of organic matter is about 1 to 3 percent in the surface layer of the Ackmore soil and 5 to 7 percent in the surface layer of the Colo soil. The substratum of the Ackmore soil generally has a low supply of available phosphorus and a very low supply of available potassium. The subsoil of the Colo soil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is good in both soils.

Most areas are cultivated. If drained and protected from runoff from the higher slopes, these soils are well suited to intensive cropping of corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Gully erosion is a hazard in areas where runoff is concentrated. It can be controlled by a system of conservation tillage that leaves crop residue on the surface and crop rotations that include meadow crops. Grassed waterways also help to prevent excessive soil loss in areas of concentrated runoff. A drainage system is needed if row crops are grown. It can lower the water table and improve the timeliness of fieldwork. Returning crop residue to the soils or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

Inadequately drained areas generally are used for pasture. Overgrazing or grazing when the soils are 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.

The land capability classification is IIw.

7—Wiota silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on plane and slightly convex slopes on low stream terraces. Areas range from 5 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown silt loam about 7 inches thick. The subsurface layer is very dark brown silt loam about 11 inches thick. The subsoil is friable silty clay loam about 31 inches thick. The upper part is dark brown, the next part is brown and dark yellowish brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is brown, mottled silt loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Nevin soils. These soils are in the lower, level areas on terraces. They make up less than 10 percent of the unit.

Permeability of this Wiota soil is moderate, 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 generally has a medium supply of available phosphorus and potassium. Tilth is good.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Because it is in areas below the more sloping upland soils, it is subject to siltation. Diversion terraces are needed in some areas to control runoff. Good tilth generally can be easily maintained. 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.

When this soil is used for pasture, overgrazing causes surface compaction and poor tilth, increases the runoff rate, and reduces forage production. 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.

7B—Wiota silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on convex slopes on low stream terraces. Areas range from 5 to 20 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown silt loam about 7 inches thick. The subsurface layer is very dark brown silt loam about 11 inches thick. The subsoil is friable silty clay loam about 31 inches thick. The upper part is dark brown, the next part is brown and dark yellowish 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.

Included with this soil in mapping are small areas of the somewhat poorly drained Nevin soils. These soils are in the lower, level areas on terraces. They make up less than 10 percent of the unit.

Permeability of this Wiota 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 medium supply of available phosphorus and potassium. Tilth is good.

Most areas are cultivated. This soil is 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 contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. Because it is in areas below the more sloping upland soils, this soil is subject to siltation. Diversion terraces are needed in some areas to control runoff. 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 is effective in controlling erosion. 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 IIe.

8B—Judson silty clay loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on foot slopes and alluvial fans. Areas range from 5 to 20 acres in size. They are irregularly shaped or elongated.

Typically, the surface layer is black silty clay loam about 7 inches thick. The subsurface layer is silty clay loam about 29 inches thick. The upper part is black, the next part is very dark brown, and the lower part is very dark grayish brown. The subsoil is friable silty clay loam about 24 inches thick. The upper part is brown, and the lower part is dark yellowish brown.

Included with this soil in mapping are small areas of the poorly drained Colo and the somewhat poorly drained Ely soils. Colo and Ely soils are in waterways above areas of the Judson soil. Colo soils have a gray subsoil. Ely soils have an olive brown subsoil. Included soils make up less than 5 percent of the unit.

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

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 receives runoff from the soils upslope, and erosion is a hazard if cultivated crops are grown. Diversion terraces divert runoff and minimize siltation from the soils upslope. Contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops help to control 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.

A cover of pasture plants is effective in controlling erosion. 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 IIe.

11B—Colo-Ely complex, 2 to 5 percent slopes. These gently sloping soils are in drainageways on uplands. The poorly drained Colo soil is near or in stream channels or waterways. It is subject to flooding. The somewhat poorly drained Ely soil is in narrow bands between the stream channels and the nearby hillsides in the uplands. Areas range from 10 to more than 100 acres in size. They are long and narrow or irregularly shaped. They are about 60 percent Colo soil and 30 percent Ely soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Colo soil is black silty clay loam about 8 inches thick. The subsurface layer is black silty clay loam about 26 inches thick. The subsoil is friable silty clay loam about 18 inches thick. The upper part is very dark gray, and the lower part is dark gray. The substratum to a depth of about 60 inches is dark gray, mottled silt loam. In places the surface layer has been deposited recently and is very dark grayish brown silt loam about 10 inches thick.

Typically, the surface layer of the Ely soil is black silty clay loam about 8 inches thick. The subsurface layer is black and very dark grayish brown silty clay loam about 21 inches thick. The subsoil is mottled, friable silty clay loam about 15 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.

Included with these soils in mapping are small areas of the well drained Judson soils. These included soils have a brown subsoil. They are in landscape positions similar to those of the Colo and Ely soils. They make up about 10 percent of the unit.

Permeability of the Colo and Ely soils is moderate. Runoff is slow on the Colo soil and moderate on the Ely soil. Available water capacity is high in both soils, and both soils have a seasonal high water table. The content of organic matter is about 5 to 7 percent in the surface layer of the Colo soil and 4 to 6 percent in the surface layer of the Ely soil. The subsoil of the Colo and Ely soils generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

Most areas are cultivated. If drained and protected

from runoff from the higher slopes, these soils are well suited to intensive cropping of corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Gully erosion is a hazard in areas where runoff is concentrated. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, crop rotations that include meadow crops, and grassed waterways. A drainage system is needed if row crops are grown. It can lower the water table and improve the timeliness of fieldwork. Returning crop residue to the soils or regularly adding other organic material improves fertility, helps to prevent surface crusting, and increases the rate of water infiltration.

Inadequately drained areas generally are used for pasture. Overgrazing or grazing when the soils are wet causes surface compaction and poor tilth, reduces 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.

The land capability classification is IIw.

20C2—Killduff silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained and moderately well drained soil is on convex side slopes and in coves near the head of drainageways 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 and dark brown silty clay loam about 7 inches thick. It is mixed with some streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is about 31 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam, the next part is dark yellowish brown, mottled silty clay loam, and the lower part is yellowish brown and grayish brown silt loam. The substratum to a depth of about 60 inches is mottled grayish brown and yellowish 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 about 2.2 to 3.2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is good.

Most areas are cultivated and used intensively for row crops. This soil is moderately well suited to corn, soybeans, and small grain. It is well suited to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. Returning crop residue to the soil or regularly adding other organic material and deferring tillage help to prevent surface crusting and increase the rate of water infiltration.

A cover of pasture plants or hay is effective in controlling erosion. 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 IIIe.

20D2—Killduff silty clay loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained and moderately well drained soil is on convex side slopes and near the head of drainageways 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 and dark brown silty clay loam about 7 inches thick. It is mixed with some streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is about 31 inches thick. It is friable. The upper part is dark yellowish brown silty clay loam, the next part is dark yellowish brown, mottled silty clay loam, and the lower part is yellowish brown and grayish brown silt loam. The substratum to a depth of about 60 inches is grayish brown and yellowish brown silt loam.

Included with this soil in mapping are small areas of the poorly drained Clarinda soils at the head of drainageways. These soils make up about 5 percent of the unit.

Permeability of this Killduff soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 2.2 to 3.2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is good.

Most areas are cultivated. This soil is moderately well suited to corn, soybeans, and small grain. It 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 by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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 IIIe.

20D3—Killduff silty clay loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, well drained and moderately well drained soil is on convex side slopes and in coves near the head of drainageways in the uplands. Areas range from 5 to 15 acres in size and are irregularly shaped.

Typically, the surface layer is dark yellowish brown silty clay loam about 7 inches thick. It contains streaks and pockets of very dark grayish brown material from the original surface soil. The subsoil is friable silty clay loam about 30 inches thick. The upper part is dark yellowish brown, the next part is dark yellowish brown and mottled, and the lower part is yellowish brown and grayish brown. The substratum to a depth of about 60 inches is grayish brown and yellowish brown silt loam.

Included with this soil in mapping are small areas of the poorly drained Clarinda soils at the head of drainageways. These soils make up less than 5 percent of the unit.

Permeability of this Killduff soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 1.2 to 2.2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is poor.

Most areas are used for cultivated crops. Some of the larger areas are used for hay or pasture. This soil is moderately well suited to corn, soybeans, and small grain. It is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a serious hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. In some areas terraces are difficult to construct because the slopes are too short and irregular. 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. More nitrogen generally is needed in areas of this soil than in areas of Killduff soils that are not so eroded. More intensive management also is needed to maintain productivity.

A cover of pasture plants or hay is effective in controlling erosion. Overgrazing causes surface compaction, 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 IVe.

20E2—Killduff silty clay loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained and moderately well drained soil is on convex side slopes near the head of drainageways in the uplands. Areas range from 5 to 20 acres in size. They are long and narrow.

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

Included with this soil in mapping are small areas of the poorly drained Clarinda soils at the head of drainageways. These soils make up less than 5 percent of the unit.

Permeability of this Killduff soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 2.2 to 3.2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is good.

Most areas are used for cultivated crops. Some of the smaller areas of this soil are cropped along with areas of adjacent soils. Some areas are used for pasture. This soil is poorly suited to corn, soybeans, and small grain. It is moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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 IVe.

20E3—Killduff silty clay loam, 14 to 18 percent slopes, severely eroded. This moderately steep, well drained and moderately well drained soil is on convex side slopes near the head of drainageways. Areas range from 5 to 20 acres in size. They are long and narrow.

Typically, the surface layer is brown silty clay loam about 7 inches thick. It contains some streaks and pockets of very dark grayish brown material from the

original surface soil. The subsoil is friable silty clay loam about 30 inches thick. The upper part is dark yellowish brown, the next part is dark yellowish brown and mottled, and the lower part is yellowish brown and grayish brown. The substratum to a depth of about 60 inches is grayish brown and yellowish brown silt loam.

Included with this soil in mapping are small areas of the poorly drained Clarinda soils at the head of drainageways. These soils make up less than 5 percent of the unit.

Permeability of this Killduff soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 1.2 to 2.2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is poor.

Most areas are used for cultivated crops. Many small areas of this soil are cropped along with areas of adjacent soils. Some areas are used for pasture. This soil is generally unsuited to cultivated crops. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture. More nitrogen generally is needed in areas of this soil than in areas of Killduff soils that are not so eroded. More intense management also is needed to improve productivity and tilth.

A cover of pasture plants or hay is effective in controlling erosion. Overgrazing causes surface compaction, 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 VIe.

24D2—Shelby loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately 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 and dark brown loam about 8 inches thick. It is mixed with some streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is firm clay loam about 34 inches thick. The upper part is dark yellowish brown, the next part is yellowish brown and strong brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In places the surface layer is thinner because the soil has been severely eroded.

Included with this soil in mapping are small areas of soils that are red or gray clay. These soils are on the higher side slopes. They have a perched water table that causes seeps during extended wet periods. They make up about 5 percent of the unit.

Permeability of this Shelby soil is moderately slow, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is about 2.2 to 3.2 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is fair.

Some areas are used for cultivated crops. Some large areas are used for pasture. Most areas of this soil are managed along with areas of adjacent soils. This soil is moderately 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. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. Stones, which are on the surface in some areas, can cause 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 is effective in controlling erosion. 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 IIIe.

24D3—Shelby clay loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, moderately 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 clay loam about 6 inches thick. It has some streaks and pockets of very dark grayish brown material from the original surface soil. The subsoil is firm clay loam about 32 inches thick. The upper part is dark yellowish brown, the next part is yellowish brown and dark yellowish brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In places the surface layer is very dark grayish brown and is about 8 inches thick.

Included with this soil in mapping are small areas of soils that are red or gray clay. These soils are on the higher side slopes. They have a perched water table that causes seeps during extended wet periods. They make up about 5 percent of the unit.

Permeability of this Shelby soil is moderately slow, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is

about 1.2 to 2.2 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is poor.

Some areas are used for cultivated crops. Some large areas are used for pasture. Most areas of this soil are managed along with areas of adjacent soils. This soil is moderately 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 serious hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. Stones, which are on the surface in some areas, can cause 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 is effective in controlling erosion. Overgrazing causes surface compaction, 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 IVe.

24E2—Shelby loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, moderately well drained soil is on convex side slopes in the uplands. Areas range from 5 to 15 acres in size. They are irregularly shaped or long and narrow.

Typically, the surface layer is mixed very dark grayish brown, brown, and dark brown loam about 8 inches thick. It includes some streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is firm clay loam about 34 inches thick. The upper part is dark yellowish brown, the next part is yellowish brown and strong brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In places the surface layer is thinner because the soil has been severely eroded.

Included with this soil in mapping are small areas of soils that are red or gray clay. These soils are on the higher side slopes. They have a perched water table that causes seeps during extended wet periods. They make up about 5 percent of the unit.

Permeability of this Shelby soil is moderately slow, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 2.2 to 3.2 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is fair.

Most areas are used for cultivated crops. Some large areas are used for pasture. Areas of this soil generally are managed along with areas of adjacent soils. This soil is poorly suited to corn, soybeans, and small grain. It is moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. Terraces can be difficult to construct in some areas because of the short, irregular slopes. Stones, which are on the surface in some areas, can cause 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 is effective in controlling erosion. 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 IVe.

24E3—Shelby clay loam, 14 to 18 percent slopes, severely eroded. This moderately steep, moderately well drained soil is on convex side slopes in the uplands. Areas range from 5 to 15 acres in size. They are irregularly shaped or long and narrow.

Typically, the surface layer is brown clay loam about 6 inches thick. It has some streaks and pockets of very dark grayish brown material from the original surface soil. The subsoil is firm clay loam about 32 inches thick. The upper part is dark yellowish brown, the next part is yellowish brown and strong brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In places the surface layer is very dark grayish brown and is about 8 inches thick.

Included with this soil in mapping are small areas of soils that are red or gray clay. These soils are on the higher side slopes. They have a perched water table that causes seeps during extended wet periods. They make up about 5 percent of the unit.

Permeability of this Shelby soil is moderately slow, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 1.2 to 2.2 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is poor.

Some areas are used for cultivated crops. Some larger areas are used for pasture. Most areas of this

soil are managed along with areas of adjacent soils. This soil is unsuited to corn, soybeans, and small grain. It is moderately suited to grasses and legumes for hay and pasture.

A cover of pasture plants or hay is effective in controlling erosion. Overgrazing causes surface compaction, 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 VIe.

43—Bremer silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on low stream terraces. It is subject to flooding. Areas range from 5 to 80 acres in size and are irregularly shaped.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer is black silty clay loam about 10 inches thick. The subsoil is about 23 inches thick. It is firm. The upper part is very dark gray silty clay, and the lower part is dark gray silty clay loam. The substratum to a depth of about 60 inches is grayish brown, mottled silty clay loam.

Included with this soil in mapping are small areas of the very poorly drained Humeston soils in depressions. These soils may have a higher content of clay in the subsoil than the Bremer soil. They make up less than 5 percent of the unit.

Permeability of this Bremer soil is moderately slow, and runoff is slow. Available water capacity is high. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 5 to 7 percent. The subsoil generally has a medium supply of available phosphorus and a low supply of available potassium. Tilth is fair.

Most areas are used for cultivated crops. Inadequately drained areas generally are used for pasture. This soil is well suited to intensive cropping of corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, a drainage system is needed to lower the water table and improve the timeliness of fieldwork. In some areas tile drainage outlets are difficult to establish because the elevation of the soil is nearly the same as that of the stream channel. In some areas the soil receives runoff from soils upslope. Diversion terraces are needed in these areas to help protect the soil from overflow and siltation. 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 used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and poor tilth and reduces forage production. 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 IIw.

63D—Chelsea loamy fine sand, 5 to 14 percent slopes. This moderately sloping and strongly sloping, excessively drained soil is on convex side slopes in the uplands. Areas range from 5 to 20 acres in size. They are oval or irregular in shape.

Typically, the surface layer is very dark gray loamy fine sand about 4 inches thick. The subsurface layer is about 38 inches thick. The upper part is brown loamy fine sand, the next part is yellowish brown fine sand, and the lower part is brownish yellow, mottled fine sand. The subsoil to a depth of about 60 inches is light yellowish brown, loose fine sand that has many lamellae of strong brown sandy loam. The lamellae are 0.5 inch to 2.0 inches thick. In places the surface layer is dark grayish brown sandy loam.

Permeability and runoff are rapid. Available water capacity is low. The content of organic matter in the surface layer is about 0.5 to 1.5 percent. The subsoil generally has a very low supply of available phosphorus and a low supply of available potassium. Tilth is poor.

Most areas are used for pasture or support native hardwoods. A few small areas of this soil are cropped along with areas of adjacent soils that are well suited to crops. This soil generally is unsuited to cultivated crops, mainly because it is droughty, low in fertility, and highly susceptible to water erosion. Soil blowing is a hazard. Sandy windblown material can damage seedlings on this soil and on the adjacent soils.

A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing, especially during dry periods, help to keep the pasture in fairly good condition.

This soil is moderately well suited to trees. The pastured areas can be converted to woodland. Seedling mortality is moderate. As a result, seedlings should be planted at close intervals. Thinning stands helps to provide adequate growing space for the surviving trees. Competing vegetation can be controlled by carefully preparing the site or by spraying or cutting.

The land capability classification is VIs.

63F—Chelsea loamy fine sand, 14 to 25 percent slopes. This moderately steep and steep, excessively drained soil is on convex slopes in the uplands. Areas range from 3 to 15 acres in size and are irregularly shaped.

Typically, the surface layer is very dark gray loamy

fine sand about 4 inches thick. The subsurface layer is about 38 inches thick. The upper part is brown loamy fine sand, the next part is yellowish brown fine sand, and the lower part is brownish yellow, mottled fine sand. The subsoil to a depth of about 60 inches is light yellowish brown, loose sand that has many lamellae of strong brown sandy loam. The lamellae are 0.5 inch to 2.0 inches thick. In places the surface layer is yellowish brown and dark grayish brown sandy loam.

Permeability and runoff are rapid. Available water capacity is low. The content of organic matter in the surface layer is about 0.5 to 1.5 percent. The subsoil generally has a very low supply of available phosphorus and a low supply of available potassium. Tilth is poor.

Most areas are used for pasture. A few support native hardwoods. 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 steep. It is also subject to soil blowing. As a result, a permanent plant cover is needed.

A cover of pasture plants or hay is effective in controlling soil blowing. Proper stocking rates, pasture rotation, and timely deferment of grazing, especially during dry periods, help to keep the pasture in fairly good condition. Renovating pastures is difficult because the slope is too steep for the use of ordinary farm machinery.

This soil is moderately well suited to trees. The pastured areas can be converted to woodland. The equipment limitation is severe, and seedling mortality and the hazard of erosion are moderate. Seedlings should be planted at close intervals because the survival rate is limited. Thinning stands helps to provide adequate growing space for the surviving trees. Erosion-control measures are needed until trees are large enough to provide a protective cover. Competing vegetation can be controlled by carefully preparing the site or by spraying or cutting. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment.

The land capability classification is VIIs.

65D2—Lindley loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained soil is on convex nose slopes and side slopes in the uplands. Areas range from 5 to 50 acres in size and are irregularly shaped.

Typically, the surface layer is dark grayish brown loam about 6 inches thick. It is mixed with some streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is firm clay loam about 36 inches thick. The upper part is dark yellowish brown and brown, the next part is brown and mottled, and the lower part is strong brown and mottled. The substratum to a depth of about 60 inches is yellowish brown and strong brown, mottled clay loam. In some eroded areas the surface layer is brown 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 about 1.5 to 2.5 percent. The subsoil generally has a low supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

Most areas are used for cultivated crops, pasture, or hay. If cultivated crops are grown, further erosion is a hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

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

This soil is moderately well suited to trees. Laying out logging trails and roads on the contour or nearly on the contour helps to control erosion. Areas that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases. Seedling mortality and plant competition are slight.

The land capability classification is IVe.

65E2—Lindley loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, moderately well drained soil is on convex nose slopes and side slopes in the uplands. Areas range from 5 to 50 acres in size and are irregularly shaped.

Typically, the surface layer is dark grayish brown loam about 6 inches thick. It is mixed with some streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is firm clay loam about 36 inches thick. The upper part is dark yellowish brown and brown, the next part is brown and mottled, and the lower part is strong brown and mottled. The substratum to a depth of about 60 inches is yellowish brown and strong brown, mottled clay loam. In other eroded areas, the surface layer is brown clay loam.

Included with this soil in mapping are small areas of Keswick soils. These soils are in narrow bands on the upper part of side slopes. They have more clay in the subsoil than the Lindley soil and can be seepy during wet periods. They make up less than 5 percent of the unit.

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

Most areas are used for cultivated crops, pasture, or hay. This soil is unsuited to corn and soybeans because of the slope and the hazard of further erosion. It is moderately well suited to grasses and legumes for hay and pasture.

A cover of pasture plants or hay is effective in controlling erosion. Reseeding or renovating the pasture is necessary in some of the steeper areas. Preparing a seedbed is difficult. Because of the slope, operating farm machinery is difficult and dangerous. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is moderately well suited to trees. The hazard of erosion, the equipment limitation, and seedling mortality are the main management concerns. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when this equipment is operated. Seedlings should be planted at close intervals because they do not survive well. Thinning the stands helps to provide growing space for the surviving trees. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIe.

65E3—Lindley clay loam, 14 to 18 percent slopes, severely eroded. This moderately steep, moderately well drained soil is on convex side slopes and nose slopes in the uplands. Areas range from 5 to 30 acres in size and are elongated.

Typically, the surface layer is dark yellowish brown clay loam about 6 inches thick. It contains some streaks and pockets of dark grayish brown material from the original surface soil. The subsoil is firm clay loam about 36 inches thick. The upper part is dark yellowish brown, the next part is brown and mottled, and the lower part is strong brown and mottled. The substratum to a depth of about 60 inches is yellowish brown and strong brown, mottled clay loam.

Included with this soil in mapping are small areas of Keswick soils. These soils are in narrow bands on the upper part of side slopes. They have a higher content of clay in the subsoil than the Lindley soil and can be seepy during wet periods. They make up less than 5 percent of the unit.

Permeability of this Lindley soil is moderately slow, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 0.4 to 2.0 percent. The subsoil generally has a low supply of available phosphorus and a very low supply of available potassium. Tilth is poor.

Many areas are cultivated. Some are in permanent pasture. This soil generally is unsuited to cultivated crops because of a serious hazard of further erosion. It is poorly suited to grasses and legumes for hay and pasture.

A cover of pasture plants or hay is effective in controlling erosion. Overgrazing causes surface compaction, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is moderately well suited to trees. The hazard of further erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when this equipment is operated. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIIe.

65F—Lindley loam, 18 to 25 percent slopes. This steep, moderately well drained soil is on convex side slopes and nose slopes in the uplands. Areas range from 5 to 30 acres in size and are elongated.

Typically, the surface layer is very dark grayish brown loam about 3 inches thick. The subsurface layer is dark grayish brown loam about 6 inches thick. The subsoil is firm clay loam about 36 inches thick. The upper part is brown, and the lower part is strong brown and mottled. The substratum to a depth of about 60 inches is yellowish brown and strong brown, mottled clay loam.

Included with this soil in mapping are small areas of Keswick soils. These soils are in narrow bands on the upper part of side slopes. They have a higher content of clay in the subsoil than the Lindley soil and can be seepy during wet periods. They make up less than 5 percent of the unit.

Permeability of this Lindley soil is moderately slow, 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 low supply of available phosphorus and a very low supply of available potassium. Tilth is good.

Most areas are in permanent pasture or are wooded. This soil is unsuited to cultivated crops because erosion is a hazard and most areas are too steep for the use of ordinary farm machinery.

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

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are the main management concerns. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when this equipment is operated. Seedlings should be planted at close intervals because the survival rate is limited. Thinning stands helps to provide adequate growing space for the surviving trees. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIIe.

65F2—Lindley loam, 18 to 25 percent slopes, moderately eroded. This steep, moderately well drained soil is on convex side slopes and nose slopes in the uplands. Areas range from 5 to 30 acres in size and are elongated.

Typically, the surface layer is dark grayish brown loam about 6 inches thick. It is mixed with some streaks and pockets of dark yellowish brown clay loam from the subsoil. The subsoil is firm clay loam about 36 inches thick. The upper part is dark yellowish brown, the next part is brown and mottled, and the lower part is strong brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In other eroded areas, the surface layer is brown clay loam.

Included with this soil in mapping are small areas of Keswick soils. These soils are in narrow bands on the upper part of side slopes. They have a higher content of clay in the subsoil than the Lindley soil and can be seepy during wet periods. They make up less than 5 percent of the unit.

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

Although formerly cultivated, most areas are used for hay or pasture or are cultivated along with adjacent soils. This soil generally is unsuited to cultivated crops because further erosion is a hazard and, in some areas, slopes are too steep for the use of ordinary farm machinery.

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

A few areas are wooded. This soil is moderately well suited to trees. Seedling mortality, the equipment limitation, and the hazard of erosion are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Seedlings should be planted at close intervals because the survival rate is limited. Thinning stands helps to provide adequate growing space for the surviving trees. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIIe.

65F3—Lindley clay loam, 18 to 25 percent slopes, severely eroded. This steep, moderately well drained soil is on convex side slopes and nose slopes in the uplands. Areas range from 3 to 20 acres in size and are elongated.

Typically, the surface layer is dark yellowish brown clay loam about 6 inches thick. It has some streaks and pockets of dark grayish brown material from the original surface soil. The subsoil is firm clay loam about 36 inches thick. The upper part is dark yellowish brown, the next part is brown and mottled, and the lower part is strong brown and mottled. The substratum to a depth of about 60 inches is yellowish brown and strong brown, mottled clay loam.

Included with this soil in mapping are small areas of Keswick soils. These soils are in narrow bands on the upper part of side slopes. They have a higher content of clay in the subsoil than the Lindley soil and can be seepy during wet periods. They make up less than 5 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 about 0.4 to 2.0 percent. The subsoil generally has a low supply of available phosphorus and a very low supply of available potassium. Tilth is poor.

Although formerly cultivated, most areas are in permanent pasture. Some are used for cultivated crops. This soil is unsuited to cultivated crops because further erosion is a severe hazard and slopes are too steep for the use of ordinary farm machinery.

A cover of pasture plants or hay is effective in controlling erosion. Overgrazing causes surface compaction, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are the main management concerns. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when this equipment is operated. Seedlings should be planted at close intervals because the survival rate is limited. Thinning stands helps to provide adequate growing space for the surviving trees. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIIe.

65G—Lindley loam, 25 to 40 percent slopes. This very steep, moderately well drained soil is on convex side slopes and nose slopes in the uplands. Areas range from 5 to 30 acres in size. They are long, narrow bands on the lower part of side slopes.

Typically, the surface layer is very dark grayish brown loam about 3 inches thick. The subsurface layer is dark grayish brown loam about 6 inches thick. The subsoil is firm clay loam about 36 inches thick. The upper part is brown, and the lower part is strong brown and mottled. The substratum to a depth of about 60 inches is yellowish brown and strong brown, mottled clay loam. In places the surface layer is dark grayish brown.

Included with this soil in mapping are small areas of Keswick soils and small areas of soils that include rock outcrop. Keswick soils are in narrow bands on the upper part of side slopes. They have a higher content of clay in the subsoil than the Lindley soil and can be seepy during wet periods. The soils in the areas of rock outcrop are shallow to limestone bedrock and are droughty. They are in the west-central part of the county along the major streams. Inclusions make up about 5 to 10 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 about 2 to 3 percent. The subsoil generally has a low supply of available phosphorus and a very low supply of available potassium. Tilth is good.

Most areas are used as woodland. Many support native hardwoods. Because of the slope and a severe hazard of erosion, this soil generally is unsuited to cultivated crops, hay, and pasture. It is moderately well suited to trees. The hazard of erosion and the equipment limitation are the main management concerns in the wooded areas. Laying out logging trails and roads on the contour helps to control erosion. Because of the slope, operating some equipment is difficult or hazardous. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases. Seedling mortality is moderate.

The land capability classification is VIIe.

83B—Kenyon loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on convex ridgetops 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 loam about 7 inches thick. The subsurface layer is dark brown loam about 6 inches thick. The subsoil is loam about 41 inches thick. The upper part is dark brown and dark yellowish brown and friable, the next part is yellowish brown and firm, and the lower part is yellowish brown, mottled, and firm. The substratum to a depth of about 60 inches is yellowish brown, mottled loam.

Permeability is moderate, and runoff is rapid. 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 potassium. Tilth is good.

Most areas are used for cultivated crops. A few are used for pasture. 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 contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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 IIe.

83C2—Kenyon loam, 5 to 9 percent slopes, moderately eroded. This moderately well drained soil is on convex ridgetops and 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 loam about 7 inches thick. It is mixed with some streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is loam about 41 inches thick. The upper part is dark brown and dark yellowish brown and friable, the next part is yellowish brown and firm, and the lower part is yellowish brown, mottled, and firm. The substratum to a depth of about 60 inches is yellowish brown, mottled loam.

Included with this soil in mapping are small areas of Dinsdale soils. Dinsdale soils have 20 to 40 inches of loess overlying glacial till. They generally are in the higher positions on the landscape. They make up about 5 percent of the unit.

Permeability of this Kenyon soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 2.2 to 3.2 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is good.

Most areas are used for cultivated crops. A few are used for pasture. This soil is moderately well suited to corn, soybeans, and small grain. It 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 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 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 is effective in controlling erosion. 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 IIIe.

88—Nevin silty clay 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 5 to 100 acres in size and are irregularly shaped.

Typically, the surface layer is black silty clay loam about 7 inches thick. The subsurface layer is silty clay loam about 15 inches thick. The upper part is black, and the lower part is very dark brown. The subsoil is mottled, friable silty clay loam about 24 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 silty clay loam.

Included with this soil in mapping are small areas of the poorly drained Bremer and the well drained Wiota soils. Bremer soils are in the lower landscape positions. Wiota soils are in the higher, convex areas on terraces. Included soils make up about 5 to 10 percent of the unit.

Permeability of this Nevin soil is moderate, and runoff is slow. Available water capacity is high. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 4 to 6 percent. The subsoil generally has a medium supply of available phosphorus and a low supply of available potassium. Tilth is good.

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. 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 is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and reduces forage production. 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.

110C—Lamont fine sandy loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on

convex ridgetops and side slopes in the uplands. Areas range from 2 to 10 acres in size. They are round, oval, or irregular in shape.

Typically, the surface layer is very dark gray fine sandy loam about 4 inches thick. The subsurface layer is dark grayish brown fine sandy loam about 10 inches thick. The subsoil extends to a depth of about 60 inches. It is yellowish brown, very friable fine sandy loam in the upper part; brownish yellow, very friable fine sandy loam in the next part; and brownish yellow, loose loamy fine sand that has lamellae of strong brown sandy loam in the lower part.

Included with this soil in mapping are small areas of Chelsea soils. These soils are in landscape positions similar to those of the Lamont soil. They have a surface layer and subsoil of loamy fine sand. They have a lower available water capacity than that of the Lamont soil. They make up less than 5 percent of the unit.

Permeability of this Lamont soil is moderately rapid, and runoff is medium. Available water capacity is moderate. The content of organic matter in the surface layer is about 0.4 to 1.5 percent. The subsoil generally has a low supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

Most areas of this soil are cultivated along with areas of adjacent soils. A few are pastured or wooded. This soil is moderately well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, soil blowing and water erosion are hazards. Sandy windblown material sometimes damages newly seeded crops on this soil and on the adjoining soils unless the surface is protected by a plant cover. Contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops help to control erosion. The soil is unsuited to terracing because ridging the moderately coarse textured material is difficult and the underlying, coarse textured material is too close to the surface. Droughtiness is a limitation in most years unless rainfall is timely. 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 is effective in controlling water erosion and soil blowing. Overgrazing 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.

This soil is moderately well suited to trees. Seedling mortality and the hazards or limitations that affect planting or harvesting are slight.

The land capability classification is IIIe.

118—Garwin silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on broad upland divides. Areas range from 5 to more than 80 acres in size and are irregularly shaped.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer is black silty clay loam about 15 inches thick. The subsoil is mottled silty clay loam about 29 inches thick. The upper part is dark gray and firm, the next part is olive gray and firm, and the lower part is olive gray and friable. The substratum to a depth of about 60 inches is olive gray, mottled silt loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Muscatine and the very poorly drained Sperry soils. Muscatine soils are in the slightly higher positions on the landscape. Sperry soils are in depressions. They have a higher content of clay in the subsoil than the Garwin soil. Included soils make up about 5 to 10 percent of the unit.

Permeability of this Garwin soil is moderate, and runoff is slow. Available water capacity is high. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 6 to 7 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is fair.

Most areas are cultivated. Inadequately drained areas generally are used for pasture. If drained, 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. Suitable tile outlets are not available in some areas. A surface drainage system is needed to remove the excess water in these areas. 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.

If this soil is used for pasture, overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth, decreases the infiltration rate, damages the plant cover, and reduces forage production. 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 IIw.

119—Muscatine silty clay loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil

is on broad upland divides. Areas range from 5 to more than 80 acres in size and are irregularly shaped.

Typically, the surface layer is black silty clay loam about 9 inches thick. The subsurface layer is silty clay loam about 13 inches thick. The upper part is very dark brown, and the lower part is very dark grayish brown and dark brown. The subsoil is mottled, friable silty clay loam about 25 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.

Included with this soil in mapping are small areas of the poorly drained Garwin and the very poorly drained Sperry soils. Garwin soils are in the lower landscape positions. Sperry soils are in depressions. Included soils make up about 5 to 10 percent of the unit.

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

Most areas are used for cultivated crops (fig. 6). Some are used for hay or pasture. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In some areas a tile drainage system is needed to help overcome the wetness and improve the timeliness of fieldwork. Deferring tillage when the soil is wet helps to maintain 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.

Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth, increases the runoff rate, and reduces forage production. 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.

119B—Muscatine silty clay loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on uplands at the head of drainageways. Areas range from 3 to 10 acres in size and are irregularly shaped.

Typically, the surface layer is black silty clay loam about 9 inches thick. The subsurface layer is silty clay loam about 13 inches thick. The upper part is very dark brown, and the lower part is very dark grayish brown and dark brown. The subsoil is mottled, friable silty clay loam about 25 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 silt loam.

Included with this soil in mapping are small areas of the poorly drained Garwin soils. These soils are closer to the drainageways than the Muscatine soils. They make up about 5 to 10 percent of the unit.

Permeability of this Muscatine soil is moderate, and runoff is slow or medium. Available water capacity is very high. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 4.4 to 6.0 percent. The subsoil generally has a low supply of available phosphorus and a very low supply of available potassium. Tilth is good.

Most areas are used for cultivated crops. Some are used for hay or pasture. 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 contour farming, crop rotations that include meadow crops, and a system of conservation tillage that leaves crop residue on the surface. In some areas a tile drainage system is needed to help overcome the wetness and improve the timeliness of fieldwork. 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 is effective in controlling erosion. 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 IIe.

120—Tama silty clay loam, 0 to 2 percent slopes. This nearly level, well drained soil is on broad ridgetops and undulating divides in the uplands. Areas range from 5 to 20 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown silty clay loam about 6 inches thick. The subsurface layer is very dark brown silty clay loam about 8 inches thick. The subsoil is friable silty clay loam about 31 inches thick. The upper part is very dark grayish brown and brown, the next part is brown, and the lower part is dark yellowish brown and yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Muscatine soils. These soils are at the head of drainageways. They have a grayer subsoil than the Tama soil. They make up about 5 percent of the unit.

Permeability of this Tama soil is moderate, and runoff

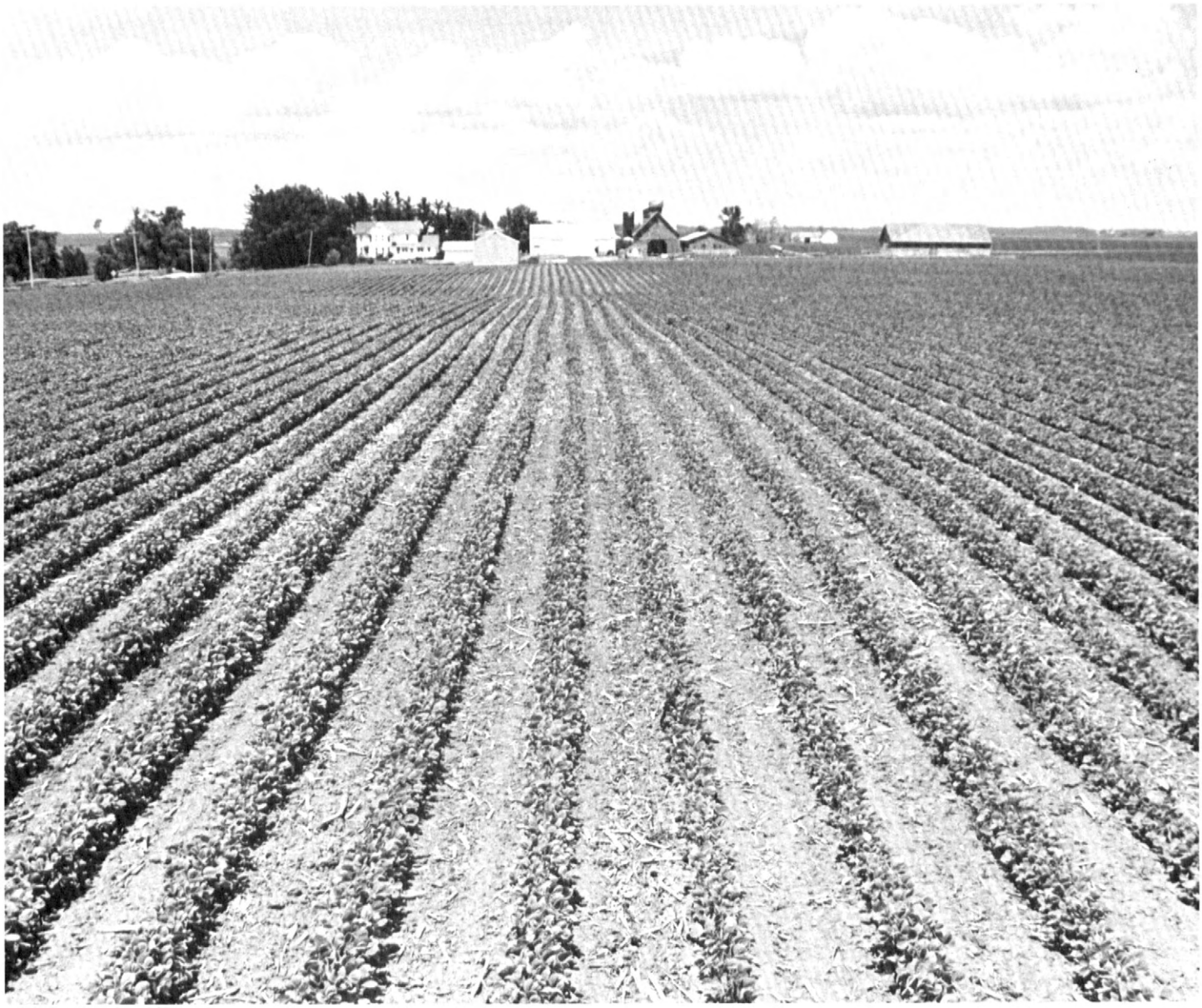

Figure 6.—Soybeans in an area of Muscatine silty clay loam, 0 to 2 percent slopes. Tama soils are in the background.

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 generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is good.

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 few areas are used for pasture. Most of these areas are small and are close to farm buildings. Overgrazing causes surface compaction and poor tilth 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.

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 silty clay loam about 6 inches thick. The subsurface layer is very dark brown silty clay loam about 8 inches thick.

The subsoil is friable silty clay loam about 31 inches thick. The upper part is very dark grayish brown and brown, the next part is brown, and the lower part is dark yellowish brown and yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled silty clay loam. In places the surface layer is dark brown and very dark grayish brown and is about 7 inches thick.

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 generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is good.

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 contour farming, crop rotations that include meadow crops, and a system of conservation tillage that leaves crop residue on the surface. 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 is effective in controlling erosion. 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 IIe.

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

Typically, the surface layer is very dark brown silty clay loam about 7 inches thick. It is mixed with some streaks and pockets of brown material from the subsoil. The subsoil is friable silty clay loam about 31 inches thick. The upper part is brown, the next part is yellowish brown and 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 glacial till is at a depth of 20 to 40 inches.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is 2.2 to 3.2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

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. It can be controlled by contour farming, terraces, crop rotations that include meadow crops, and a system of conservation tillage that leaves crop residue on the surface. 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 is effective in controlling erosion. 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 IIe.

120C—Tama silty clay loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on ridges and side slopes in the uplands. Areas range from 5 to 40 acres in size. They are elongated or irregular in shape.

Typically, the surface layer is very dark brown silty clay loam about 6 inches thick. The subsurface layer is very dark brown silty clay loam about 8 inches thick. The subsoil is friable silty clay loam about 31 inches thick. The upper part is very dark grayish brown and brown, the next part is brown, and the lower part is dark yellowish brown and yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled silty clay loam. In places the surface layer is mixed 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 about 3 to 4 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is good.

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 contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. Overgrazing causes surface compaction and poor tilth, reduces forage production, 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 IIIe.

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 5 to 80 acres in size. They are elongated or irregular in shape.

Typically, the surface layer is very dark brown silty clay loam about 7 inches thick. It is mixed with some streaks and pockets of brown material from the subsoil. The subsoil is friable silty clay loam about 31 inches thick. The upper part is brown, the next part is yellowish brown and 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 some places the surface layer is dark yellowish brown. In other places glacial till is at a depth of 20 to 40 inches.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is about 2.2 to 3.2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

Most areas are cultivated. This soil is moderately well suited to corn, soybeans, and small grain. It 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 by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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 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 5 to 20 acres in size. They are elongated or irregular in shape.

Typically, the surface layer is brown silty clay loam about 6 inches thick. It has some streaks and pockets of very dark brown material from the original surface soil. The subsoil is friable silty clay loam about 27 inches thick. The upper 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, mottled silt loam. In some places the surface layer is very dark brown. In other places glacial till is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Liscomb soils. These soils are in landscape positions similar to those of the Tama soil. They have more sand throughout the profile than the Tama soil. They make up less than 5 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 about 1.2 to 2.2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is poor.

Most areas are cultivated. This soil is moderately well suited to corn, soybeans, and small grain. It is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a serious hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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. More nitrogen generally is needed in areas of this soil than in areas of Tama soils that are not so eroded. More intensive management also is needed to maintain productivity.

A cover of pasture plants or hay is effective in controlling erosion. 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 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 5 to 60 acres in size and are elongated.

Typically, the surface layer is very dark brown silty clay loam about 7 inches thick. It is mixed with some streaks and pockets of brown material from the subsoil. The subsoil is friable silty clay loam about 31 inches thick. The upper part is brown, the next part is yellowish brown and 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 some places the surface layer is brown. In other places

glacial till is at a depth of 20 to 40 inches.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 2.2 to 3.2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

Most areas are cultivated. This soil is moderately well suited to corn, soybeans, and small grain. It 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 by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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 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 5 to 20 acres in size. They are elongated or irregular in shape.

Typically, the surface layer is brown silty clay loam about 6 inches thick. It contains some streaks and pockets of very dark brown material from the original surface soil. The subsoil is friable silty clay loam about 27 inches thick. The upper 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, mottled silt loam. In some places the surface layer is very dark brown. In other places glacial till is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Liscomb soils. These soils are in landscape positions similar to those of the Tama soil. They have more sand throughout the profile than the Tama soil. They make up less than 5 percent of the unit.

Permeability of this Tama soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 1.2 to 2.2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is poor.

Most areas are cultivated. This soil is moderately well suited to corn, soybeans, and small grain. It is well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a serious hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. In some areas terraces are difficult to construct because the slopes are short and irregularly shaped. 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. More nitrogen generally is needed in areas of this soil than in areas of Tama soils that are not so eroded. More intensive management also is needed to maintain productivity

A cover of pasture plants or hay is effective in controlling erosion. 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 IVe.

120E2—Tama silty clay loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is on 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 silty clay loam about 7 inches thick. It is mixed with some streaks and pockets of yellowish brown material from the subsoil. The subsoil is friable silty clay loam about 30 inches thick. The upper 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, mottled silt loam.

Included with this soil in mapping are small areas of Shelby soils. These soils are on the lower part of side slopes in the uplands. They are clay loam and have a firm subsoil. They make up about 5 percent of the map unit.

Permeability of this Tama soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 2.2 to 3.2 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

Most areas are used for cultivated crops. Many small areas of this soil are cropped along with areas of adjacent soils. Some areas are used for pasture. This soil is poorly suited to corn, soybeans, and small grain. It 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 by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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 IVe.

122—Sperry silt loam, 0 to 1 percent slopes. This level, very poorly drained soil is in slight depressions on broad upland divides. It is subject to ponding. Areas range from 3 to 30 acres in size and are irregularly shaped.

Typically, the surface layer is black silt loam about 7 inches thick. The subsurface layer is gray, mottled silt loam about 6 inches thick. The subsoil is about 33 inches thick. The upper part is very dark gray, friable silty clay loam, the next part is dark gray and very dark gray, mottled, firm silty clay, and the lower part is gray, firm, mottled silty clay loam. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam.

Included with this soil in mapping are small areas of soils that have a calcareous surface layer. These soils are along the edge of the delineations. They are higher on the landscape than the Sperry soil. Also, they are lower in fertility and have a lower content of organic matter in the surface layer. They make up less than 5 percent of the unit.

Permeability of this Sperry soil is slow, and runoff is ponded. Available water capacity is high. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 3 to 4 percent. The subsoil generally has a low supply of available phosphorus and potassium. Tilth is fair.

Most areas are cultivated. This soil is moderately well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, a subsurface or surface drainage system helps to overcome the wetness and provide aeration and a deep root zone for plants. In some areas tile drains generally do not function satisfactorily because of the slow permeability. Both surface and subsurface drainage systems are needed in these areas. Returning crop residue to the soil or regularly adding other organic material and reducing tillage when the soil is wet improve fertility and help to prevent surface crusting and the formation of clods.

A few areas are used for pasture or hay. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and decreases the rate of water infiltration. 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 IIIw.

133—Colo silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on flood plains along the major streams and their tributaries. It is subject to flooding. Areas range from 15 to several hundred acres in size. They are narrow or wide and elongated.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer is black silty clay loam about 26 inches thick. The subsoil is friable silty clay loam about 18 inches thick. The upper part is very dark gray, and the lower part is dark gray. The substratum to a depth of about 60 inches is dark gray, mottled silt loam. In some places the surface layer is recently deposited silt loam about 10 inches thick. In other places the subsoil is not so thick.

Included with this soil in mapping are small areas of the somewhat poorly drained Nevin and the well drained Wiota soils. Nevin and Wiota soils are on low alluvial terraces. They make up about 5 to 10 percent of the unit.

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

Most areas are used for cultivated crops. Some are in permanent pasture (fig. 7). If drained and protected from flooding, this soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. It is wet as a result of the flooding, the very slow runoff or ponding, and the seasonal high water table. The flooding damages crops in some years. Drainage tile can function adequately if outlets are available. In some of the smaller areas, diversion terraces help to control floodwater. In the larger areas dikes or levees are needed to control floodwater.

The wetter areas are used mainly as pasture. Overgrazing or grazing during wet periods causes excessive 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 IIw.

Figure 7.—A pastured area of Colo silty clay loam, 0 to 2 percent slopes.

133+—Colo silt loam, overwash, 0 to 2 percent slopes. This nearly level, poorly drained soil is on flood plains along the major streams and their tributaries. It is subject to flooding. Areas range from 15 to more than 100 acres in size. They are narrow or wide and elongated.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface

layer is about 34 inches thick. The upper part is black silt loam, and the lower part is black silty clay loam. The subsoil is friable silty clay loam about 14 inches thick. The upper part is very dark gray, and the lower part is dark gray. The substratum to a depth of about 60 inches is dark gray, mottled silt loam. In places the surface layer is silty clay loam.

Included with this soil in mapping are small areas of Ackmore soils. These soils have a thicker layer of silty overwash than the Colo soil and a lower content of organic matter in the surface layer. Also, they are closer to the stream channel. They make up about 10 percent of the unit.

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

Most areas are used for cultivated crops. Some are in permanent pasture. If drained and protected from flooding, this soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. It is wet as a result of the flooding, the very slow runoff or ponding, and the seasonal high water table. The flooding damages crops in some years. Drainage tile can function adequately if outlets are available. In the larger areas dikes and levees help to control floodwater and prevent additional deposits of silty overwash from damaging crops and pasture.

The wetter areas are used mainly as pasture. Overgrazing or grazing during wet periods causes excessive 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 IIw.

134—Zook silty clay, 0 to 2 percent slopes. This nearly level, poorly drained soil is on flood plains along the major streams. It is frequently flooded. Areas range from 10 to 40 acres in size. They are narrow or wide and elongated.

Typically, the surface layer is black silty clay about 7 inches thick. The subsurface layer is silty clay about 25 inches thick. The upper part is black, and the lower part is black and very dark gray. The subsoil is about 15 inches thick. The upper part is very dark gray, mottled, firm silty clay, and the lower part is dark gray, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is gray, mottled silty clay loam. In places the surface layer is light colored, recently deposited silt loam.

Permeability is slow, and runoff is very slow or ponded. Available water capacity is moderate. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 5 to 7 percent. The subsoil generally has a medium supply of available phosphorus and a low supply of available potassium. Tilth is poor.

Most of the acreage is in permanent pasture or is idle land. If protected from flooding, some areas are used as cropland. This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. It is wet as a result of the flooding, the very slow runoff or ponding, and the seasonal high water table. The flooding damages crops in some years. Diversion terraces, levees, and improvements to the channel help to control the flooding and the runoff from adjacent areas.

The wetter areas are used mainly as pasture. Overgrazing or grazing during wet periods causes excessive 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 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 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 44 inches thick. It is friable. The upper part is brown silt loam, the next part is dark yellowish brown silty clay loam, and the lower part is yellowish brown, mottled silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the surface layer is thicker and darker colored and has a higher content of organic matter.

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

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 contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. Slopes generally are long and uniform enough for terracing and 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.

A cover of pasture plants or hay is effective in controlling erosion. 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.

This soil is well suited to trees. Seedling mortality and the hazards or limitations that affect planting or harvesting are slight.

The land capability classification is IIe.

162C—Downs 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 80 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 44 inches thick. It is friable. The upper part is brown silt loam, the next part is dark yellowish brown silty clay loam, and the lower part is yellowish brown, mottled silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the surface layer is mixed with brown material from the subsoil.

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

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 contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. Returning crop residue to the soil or regularly adding other organic material and deferring tillage when the soil is wet help to maintain tilth, prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay is effective in controlling erosion. 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.

A few areas support native hardwoods. This soil is well suited to trees. Seedling mortality and the hazards or limitations that affect planting or harvesting are slight.

The land capability classification is IIIe.

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 100 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. It is mixed with some streaks and pockets of brown material from the subsoil. The subsoil is about 42 inches thick. It is friable. The upper part is brown silt loam, the next part is dark yellowish brown silty clay loam, and the lower part is yellowish brown, mottled silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. 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 in cultivated areas. Available water capacity is high or very 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. Tilth is fair.

Most areas are cultivated (fig. 8). This soil is moderately well suited to corn, soybeans, and small grain. It 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 by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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.

This soil is well suited to trees. Seedling mortality and the hazards or limitations that affect planting or harvesting are slight.

The land capability classification is IIIe.

162D—Downs silt loam, 9 to 14 percent slopes. This strongly sloping, well drained soil is on long, convex side slopes and narrow ridges in the uplands. Areas range from 5 to 20 acres in size. They are irregularly shaped or elongated.

Figure 8.—A moderately sloping and strongly sloping area of Downs soils used for corn and alfalfa.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 44 inches thick. It is friable. The upper part is brown silt loam, the next part is dark yellowish brown, mottled silty clay loam, and the lower part is yellowish brown, mottled silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the surface layer is mixed with brown material from the subsoil.

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

Most areas are in permanent pasture. Some are wooded. A few have been cleared of trees and are used for cultivated crops. This soil is moderately well suited to corn, soybeans, and small grain. It 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 by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. Overgrazing causes surface

compaction and poor tilth and reduces forage production. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

Some areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting or harvesting if suitable species are selected for planting and the stand is managed properly. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is IIIe.

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 80 acres in size. They are elongated or irregular in shape.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. It is mixed with some streaks and pockets of brown silt loam from the subsoil. The subsoil is about 42 inches thick. It is friable. The upper part is dark yellowish brown silt loam, the next part is dark yellowish brown silty clay loam, and the lower part is yellowish brown, mottled silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the surface layer is brown silty clay loam.

Permeability is moderate, and runoff is rapid. Available water capacity is high or very 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. Tilth is fair.

Most areas are cultivated. This soil is moderately well suited to corn, soybeans, and small grain. It 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 by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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.

This soil is well suited to trees. Seedling mortality and the hazards or limitations that affect planting or harvesting are slight.

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 long, convex side slopes in the uplands. Areas range from 10 to 30 acres in size and are elongated.

Typically, the surface layer is brown and yellowish brown silty clay loam about 6 inches thick. It contains some streaks and pockets of very dark grayish brown silt loam from the original surface soil. The subsoil is friable silty clay loam about 36 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, mottled silt loam. In places the surface layer is very dark grayish 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 about 1 to 2 percent. The subsoil generally has a high supply of available phosphorus and a very low supply of available potassium. Tilth is poor.

Most areas are cultivated. This soil is poorly suited to small grain. It is moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a serious hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. In some places terraces are difficult to construct because the slopes are short and irregular. 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. More nitrogen generally is needed in areas of this soil than in areas of Downs soils that are not so eroded. More intensive management also is needed to maintain productivity.

A cover of pasture plants or hay is effective in controlling erosion. 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.

This soil is well suited to trees. Seedling mortality and the hazards or limitations that affect planting or harvesting are slight.

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 10 to 20 acres in size and are elongated.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. It is mixed with some streaks and pockets of brown material from the subsoil. The subsoil is about 42 inches thick. It is friable. The upper part is brown silt loam, the next part is dark yellowish brown silty clay loam, and the lower part is yellowish brown, mottled silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the surface layer is brown silty clay loam.

Permeability is moderate, and runoff is rapid. Available water capacity is high or very 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. Tilth is fair.

Most areas are used for cultivated crops. A few are used for pasture. This soil is poorly suited to corn, soybeans, and small grain. It is moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Tree cuttings and seedlings survive and grow well if competing vegetation is controlled by carefully preparing the site or by spraying or cutting. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

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 30 acres in size and are elongated.

Typically, the surface layer is brown silty clay loam about 6 inches thick. It contains some streaks and pockets of very dark grayish brown silt loam from the original surface soil. The subsoil is friable silty clay loam about 36 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, mottled silt loam. In places the surface layer is very dark grayish 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 about 1 to 2 percent. The subsoil generally has a high supply of available phosphorus and a very low supply of available potassium. Tilth is poor.

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

A cover of pasture plants is effective in controlling erosion. Overgrazing causes surface compaction, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in fairly good condition.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIe.

162F—Downs silt loam, 18 to 25 percent slopes. This steep, well drained soil is on short, convex side slopes. Areas range from 5 to 20 acres in size. They are narrow and elongated.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The subsurface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is about 42 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, mottled silt loam.

Included with this soil in mapping are small areas of Gara soils. These soils are in landscape positions similar to those of the Downs soil. They have a surface layer of loam and a subsoil of clay loam. They make up about 5 to 10 percent of the unit.

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

A few areas are used for cultivated crops. Most are used for pasture. A few are wooded. This soil generally is unsuited to cultivated crops because of the slope and a severe hazard of erosion. It is moderately well suited to grasses and legumes for hay and pasture. Operating farm machinery is difficult because of the slope, gullies, and waterways. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture.

A cover of pasture plants is effective in controlling erosion. Overgrazing 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.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

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 20 acres in size. They are narrow and elongated.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. It is mixed with some streaks and pockets of brown material from the subsoil. The subsoil is friable silt loam about 42 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 the surface layer is brown silty clay loam.

Included with this soil in mapping are small areas of Gara soils. These soils are in landscape positions similar to those of the Downs soil. They have a surface layer of loam and a subsoil of clay loam. They make up about 10 percent of the unit.

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

Many areas are used for cultivated crops. Some are used for pasture. Most areas of this soil are managed along with areas of adjacent soils. This soil generally is unsuited to cultivated crops because of the slope and a severe hazard of erosion. It is moderately well suited to grasses and legumes for hay and pasture. Operating farm machinery is difficult because of the slope, gullies, and waterways. If cultivated crops are grown, further erosion is a hazard. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture.

A cover of pasture plants is effective in controlling erosion. Overgrazing 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 fair condition.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIe.

162F3—Downs 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 20 acres in size and are elongated.

Typically, the surface layer is brown silty clay loam about 6 inches thick. It contains some streaks and

pockets of very dark grayish brown silt loam from the original surface soil. The subsoil is friable silty clay loam about 36 inches thick. The upper 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, mottled silt loam. In places the surface layer is very dark grayish brown silt loam.

Included with this soil in mapping are small areas of Gara soils. These soils are on the lower part of side slopes. They have a subsoil of firm clay loam and are moderately slowly permeable. They make up less than 5 percent of the unit.

Permeability of this Downs soil is moderate, and runoff is rapid. 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 high supply of available phosphorus and a very low supply of available potassium. Tilth is poor.

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

A cover of pasture plants is effective in controlling erosion. Overgrazing causes surface compaction, 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.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIIe.

163B—Fayette 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 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark gray silt loam about 3 inches thick. The subsurface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is about 36 inches thick. It is friable. The upper part is brown silt loam, the next part is dark yellowish brown silty clay loam, and the lower part is yellowish brown, mottled silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt 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 the poorly drained Traer soils. These soils are in depressions and in the lower landscape positions. They have a gray, mottled subsoil and are slowly permeable. 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 about 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium. Tilth is good.

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 contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 controlling erosion. 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.

This soil is well suited to trees. Seedling mortality and the hazards or limitations that affect planting or harvesting are slight.

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 silt loam about 3 inches thick. The subsurface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is about 36 inches thick. It is friable. The upper part is brown silt loam, the next part is dark yellowish brown silty clay loam, and the lower part is yellowish brown, mottled silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the surface layer is dark grayish brown and is about 7 inches thick.

Permeability 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 low supply of available potassium. Tilth is good.

Most areas are cultivated. This soil is moderately well suited to corn, soybeans, and small grain. It 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 contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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.

A few areas support native hardwoods. No major hazards or limitations affect planting or harvesting if suitable species are selected for planting and the stand is managed properly.

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 more than 80 acres in size and are irregularly shaped.

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

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

Most areas are cultivated. This soil is moderately well suited to corn, soybeans, and small grain. It 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 by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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.

This soil is well suited to trees. No major hazards or limitations affect planting or harvesting if suitable species are selected for planting and the stand is managed properly.

The land capability classification is IIIe.

163D—Fayette silt loam, 9 to 14 percent slopes. This strongly sloping, well drained soil is on long, convex side slopes and narrow ridges in the uplands. Areas range from 10 to 20 acres in size. They are irregularly shaped or elongated.

Typically, the surface layer is very dark gray silt loam about 3 inches thick. The subsurface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is about 36 inches thick. It is friable. The upper part is brown silt loam, the next part is dark yellowish brown silty clay loam, and the lower part is yellowish brown, mottled silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the surface layer is dark grayish brown and is 7 inches thick.

Included with this soil in mapping are small areas of Keswick and Lindley soils on the lower part of side slopes. Keswick soils have a clayey subsoil and are slowly permeable. Lindley soils are moderately slowly permeable. Included soils 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 about 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium. Tilth is good.

Most areas are wooded or are in permanent pasture. A few have been cleared of trees and used for cultivated crops. This soil is moderately well suited to corn, soybeans, and small grain. It 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 contour farming, terraces, a system of

conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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.

Many areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting or harvesting if suitable species are selected for planting and the stand is managed properly. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

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 long, convex side slopes in the uplands. Areas range from 10 to 60 acres in size. They are irregularly shaped or elongated.

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

Included with this soil in mapping are small areas of Keswick and Lindley soils on the lower, convex side slopes. Keswick soils have a clayey subsoil and are slowly permeable. Lindley soils are moderately slowly permeable. Included soils 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 about 1.5 to 2.5 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium. Tilth is fair.

Most areas are used for cultivated crops. A few are used for pasture. This soil is moderately well suited to corn, soybeans, and small grain. It 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 by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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.

This soil is well suited to trees. No major hazards or limitations affect planting or harvesting if suitable species are selected for planting and the stand is managed properly.

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 5 to 20 acres in size. They are elongated or irregular in shape.

Typically, the surface layer is brown silty clay loam about 6 inches thick. It contains some streaks and pockets of dark grayish brown silt loam from the original surface soil. The subsoil is friable silty clay loam about 32 inches thick. The upper 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, mottled silt loam. In places the surface layer is mixed 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 about 0.4 to 2.0 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium. Tilth is poor.

Most areas are cultivated. This soil is poorly suited to corn, soybeans, and small grain. It is moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a serious hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. In a few areas, constructing terraces is difficult because the slopes are short and irregularly shaped. 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. More nitrogen generally is needed in areas of this soil than in areas of Fayette soils that are not so eroded. More intensive management is also needed to maintain productivity and improve tilth.

A cover of pasture plants or hay is effective in controlling erosion. Overgrazing causes surface compaction, 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.

This soil is well suited to trees. No major hazards or limitations affect planting or harvesting if suitable species are selected for planting and the stand is managed properly.

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. They are elongated or irregular in shape.

Typically, the surface layer is very dark gray silt loam about 3 inches thick. The subsurface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is about 36 inches thick. It is friable. The upper part is brown silt loam, the next part is dark yellowish brown silty clay loam, and the lower part is yellowish brown, mottled silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the surface layer is dark grayish brown and about 7 inches thick.

Included with this soil in mapping are small areas of Keswick and Lindley soils on the lower part of side slopes. Keswick soils have a clayey subsoil and are slowly permeable. Lindley soils are moderately slowly permeable. 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 about 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium. Tilth is good.

Most areas are wooded or are in permanent pasture. This soil is poorly suited to corn, soybeans, and small grain. It is moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a serious hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

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 40 acres in size. They are elongated or irregular in shape.

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

Included with this soil in mapping are small areas of Keswick and Lindley soils on the lower part of side slopes. Keswick soils have a red, clayey subsoil and are slowly permeable. Lindley soils are moderately slowly permeable. Included soils 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 about 1.5 to 2.5 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium. Tilth is fair.

Many areas are used for cultivated crops. A few are used for pasture. This soil is poorly suited to corn, soybeans, and small grain. It is moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue

on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. Overgrazing causes surface compaction and poor tilth, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree generation and causes root damage, which leads to heartrot and other diseases.

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 silty clay loam about 6 inches thick. It has some streaks and pockets of dark grayish brown silt loam from the original surface soil. The subsoil is friable silty clay loam about 32 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown, mottled silt loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the surface layer is mixed 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 are moderately slowly permeable. 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 about 0.4 to 2.0 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium. Tilth is poor.

Many areas are used for cultivated crops. Some are in permanent pasture. This soil generally is unsuited to cultivated crops because further erosion is a serious hazard. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture. More nitrogen generally is needed in areas of this soil than in areas of Fayette soils that are not so eroded. More intensive management also is needed to improve fertility and productivity.

A cover of pasture plants or hay is effective in controlling erosion. Overgrazing causes surface compaction, 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.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

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. They are elongated or irregular in shape.

Typically, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is dark grayish brown silt loam about 11 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, mottled silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the surface layer is dark grayish brown and is about 7 inches thick.

Included with this soil in mapping are small areas of Lindley and Timula soils. Lindley soils are on the lower part of side slopes. They are moderately slowly permeable. Timula soils are in coves at the head of drainageways. Their subsoil and substratum are grayer than those of the Fayette soil. Included soils make up about 5 to 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 about 2 to 3 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium. Tilth is good.

Most areas are wooded or are in permanent pasture. This soil generally is unsuited to cultivated crops

because of the slope and a severe hazard of erosion. It is moderately well suited to grasses and legumes for hay and pasture. Operating farm machinery is difficult because of the slope, gullies, and waterways.

A cover of pasture plants is effective in controlling erosion. Overgrazing causes surface compaction, 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.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

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 30 acres in size and are elongated.

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

Included with this soil in mapping are small areas of Lindley and Timula soils. Lindley soils are on the lower part of side slopes. They are moderately slowly permeable. Timula soils are in coves at the head of drainageways. Their subsoil and substratum are grayer than those of the Fayette soil. Included soils make up about 5 to 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 about 1.5 to 2.5 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium. Tilth is fair.

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

A cover of pasture plants is effective in controlling erosion. Overgrazing causes surface compaction, 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.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

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 silty clay loam about 6 inches thick. It contains some streaks and pockets of grayish brown silt loam from the original surface soil. The subsoil is friable silty clay loam about 32 inches thick. The upper 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, mottled silt loam. In places the surface layer is dark grayish brown and brown silt loam.

Included with this soil in mapping are small areas of Lindley and Timula soils. Lindley soils are on the lower part of side slopes. They are moderately slowly permeable. Timula soils are in coves at the head of drainageways. Their subsoil and substratum are grayer than those of the Fayette soil. Included soils 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 about 0.4 to 2.0 percent. The subsoil generally has a high supply of available phosphorus and a low supply of available potassium. Tilth is poor.

Many areas are used for cultivated crops. Some are in permanent pasture. This soil generally is unsuited to cultivated crops because of the slope and a severe hazard of erosion. It is moderately well suited to

grasses and legumes for hay and pasture. Operating farm machinery is difficult because of the slope and the gullies and waterways. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture.

A cover of pasture plants is effective in controlling erosion. Overgrazing causes surface compaction, 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.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

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 40 acres in size and are elongated.

Typically, the surface layer is very dark gray silt loam about 3 inches thick. The subsurface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is about 36 inches thick. It is friable. The upper part is brown silt loam, the next part is dark yellowish brown silty clay loam, and the lower part is yellowish brown, mottled silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam.

Included with this soil in mapping are small areas of Lindley soils on the lower part of side slopes. These soils are moderately slowly permeable. 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 or very 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 low supply of available potassium. Tilth is good.

Nearly all areas are wooded or are in permanent pasture. This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIIe.

164—Traer silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on broad upland ridgetops. Areas range from 5 to 30 acres in size. They are oval or irregular in shape.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is grayish brown silt loam about 3 inches thick. The subsoil is silty clay loam about 40 inches thick. The upper part is dark grayish brown, mottled, and friable; the next part is dark grayish brown, mottled, and firm; and the lower part is mottled grayish brown, olive gray, light olive gray, and yellowish brown and friable. The substratum to a depth of about 60 inches is mottled light olive gray and yellowish brown silt loam.

Permeability is slow, and runoff is slow to ponded. Available water capacity is high. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 2.5 to 3.5 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of potassium. Tilth is good.

Most areas are cultivated. This soil is moderately well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, a subsurface or surface drainage system helps to overcome the wetness and provide aeration and a deep root zone for plants. Returning crop residue to the soil or regularly adding other organic material and reducing tillage when the soil is wet improve fertility and help to prevent surface crusting and the formation of clods.

A few areas are used for pasture and hay. Overgrazing causes surface compaction and poor tilth and decreases the rate of water infiltration. 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 IIIw.

174B—Bolan loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on convex 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 loam about 8 inches thick. The subsurface layer is very dark grayish brown loam about 5 inches thick. The subsoil is about 21 inches thick. It is friable. The upper part is

brown loam, the next part is dark yellowish brown loam, and the lower part is dark yellowish brown fine sandy loam. The upper part of the substratum is dark yellowish brown loamy fine sand, and the lower part to a depth of about 60 inches is light yellowish brown sand.

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

Most areas are cultivated. This soil is moderately 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 contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. The soil can be droughty in years of below average rainfall. 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 is effective in controlling water erosion and soil blowing. Pastures can be improved if they are renovated and reseeded. Overgrazing 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 periods help to keep the pasture in good condition.

The land capability classification is IIe.

174C—Bolan loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on convex ridgetops and 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 brown loam about 8 inches thick. The subsurface layer is very dark grayish brown loam about 5 inches thick. The subsoil is about 21 inches thick. It is friable. The upper part is brown loam, the next part is dark yellowish brown loam, and the lower part is dark yellowish brown fine sandy loam. The upper part of the substratum is dark yellowish brown loamy fine sand, and the lower part to a depth of about 60 inches is light yellowish brown sand.

Included with this soil in mapping are some areas of soils that have fine sand in the surface layer and subsoil. These soils are in landscape positions similar to those of the Bolan soil. They have a lower content of organic matter than the Bolan soil and a lower water-holding capacity. They make up about 5 percent of the unit.

Permeability is moderate in the upper part of this Bolan 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 about 2.5 to 3.5 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is good.

Most areas are cultivated. This soil is moderately 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 contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. The soil is poorly suited to terracing because ridging the moderately coarse textured material is difficult and the underlying, coarse textured material is too close to the surface. If terraces are built, cuts should not expose the coarse textured material in the terrace channels. The soil can be droughty during years of below average rainfall. It 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 is effective in controlling water erosion and soil blowing. Pastures can be improved if they are renovated and reseeded. Overgrazing 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 periods help to keep the pasture in good condition.

The land capability classification is IIIe.

175B—Dickinson fine sandy loam, 2 to 5 percent slopes. This gently sloping, somewhat excessively drained soil is on convex ridgetops and side slopes in the uplands. Areas range from 5 to 15 acres in size. They are round, oval, or irregularly shaped.

Typically, the surface layer is very dark brown fine sandy loam about 8 inches thick. The subsurface layer is very dark grayish brown and dark brown fine sandy loam about 5 inches thick. The subsoil is about 16 inches thick. It is very friable. The upper part is brown and dark brown fine sandy loam, and the lower part is dark yellowish brown loamy fine sand. The upper part of the substratum is yellowish brown and light yellowish brown loamy fine sand, and the lower part to a depth of about 60 inches is light yellowish brown sand that has lamellae of yellowish brown sandy loam.

Permeability is moderately rapid, and runoff is

medium. Available water capacity is 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. Tilth is good.

Most areas are used for cultivated crops. Some are used for hay or pasture. This soil is moderately well suited to corn, soybeans, and small grain. It is well suited to grasses and legumes for hay or pasture. If cultivated crops are grown, soil blowing and water erosion are hazards. Sandy windblown material sometimes damages newly seeded crops on this soil and on the adjoining soils unless the surface is protected by a plant cover. Contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops help to control erosion. Droughtiness is a limitation in most years unless rainfall is timely. 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 is effective in controlling water erosion and soil blowing. Pastures can be improved if they are renovated and reseeded. Overgrazing 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 IIIe.

175C—Dickinson fine sandy loam, 5 to 9 percent slopes. This moderately sloping, somewhat excessively drained soil is on convex ridgetops and side slopes in the uplands. Areas range from 5 to 15 acres in size. They are round, oval, or irregular in shape.

Typically, the surface layer is very dark brown fine sandy loam about 8 inches thick. The subsurface layer is very dark grayish brown and dark brown fine sandy loam about 5 inches thick. The subsoil is about 16 inches thick. It is very friable. The upper part is brown and dark brown fine sandy loam, and the lower part is dark yellowish brown loamy fine sand. The upper part of the substratum is yellowish brown and light yellowish brown loamy fine sand, and the lower part to a depth of about 60 inches is light yellowish brown sand that has lamellae of yellowish brown sandy loam. In places the surface layer is very dark grayish brown and brown and is about 6 inches thick.

Permeability is moderately rapid, and runoff is medium. Available water capacity is 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. Tilth is good.

Most areas are used for cultivated crops. Some are used for hay or pasture. This soil is moderately well suited to corn, soybeans, and small grain. It is well suited to grasses and legumes for hay or pasture. If cultivated crops are grown, soil blowing and water erosion are hazards. Sandy windblown material sometimes damages newly seeded crops on this soil and on the adjoining soils unless the surface is protected by a plant cover. Contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops help to control erosion. The soil is poorly suited to terracing because ridging the moderately coarse textured material is difficult and the underlying, coarse textured material is too close to the surface. If terraces are built, cuts should not expose the coarse textured material in the terrace channels. Droughtiness is a limitation in most years unless rainfall is timely. 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 is effective in controlling water erosion and soil blowing. Pastures can be improved if they are renovated and reseeded. Overgrazing 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 IIIe.

179D2—Gara loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is on upland side slopes. Areas range from 5 to 20 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. It is mixed with some streaks and pockets of strong brown clay loam from the subsoil. The subsoil is firm clay loam about 43 inches thick. The upper part is strong brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In places the surface layer is strong brown clay loam.

Included with this soil in mapping are small areas of the moderately well drained Armstrong soils on the upper part of side slopes. These soils have a red subsoil that is higher in clay content than the Gara soil. They make up about 5 percent of the unit.

Permeability of this Gara soil is moderately slow, 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 low supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

Many areas are used for cultivated crops. Some are used for pasture or hay. This soil is poorly suited to corn, soybeans, and small grain. It is moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

A cover of pasture plants or hay is effective in controlling erosion. 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.

This soil is moderately well suited to trees. Laying out logging trails and roads on the contour or nearly on the contour helps to control erosion. Areas that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases. Seedling mortality and plant competition are slight.

The land capability classification is IVe.

179D3—Gara clay loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, well drained soil is on upland side slopes. Areas range from 5 to 20 acres in size and are elongated.

Typically, the surface layer is strong brown clay loam about 6 inches thick. It has some streaks and pockets of very dark grayish brown loam from the original surface soil. The subsoil is firm clay loam about 39 inches thick. The upper part is strong brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In places the surface layer is strong brown 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 about 1 to 2 percent. The subsoil generally has a low supply of available phosphorus and a very low supply of available potassium. Tilth is poor.

Many areas are used for cultivated crops. Some large areas are used for pasture. Most areas of this soil are managed along with areas of adjacent soils. This soil is moderately 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 serious hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. Stones, which are on the surface in some areas, can cause 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 is effective in controlling erosion. 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.

This soil is moderately well suited to trees. Laying out logging trails and roads on the contour or nearly on the contour helps to control erosion. Areas that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases. Seedling mortality and plant competition are slight.

The land capability classification is VIe.

179E2—Gara loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is on upland side slopes. Areas range from 5 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown loam about 6 inches thick. It is mixed with some streaks and pockets of strong brown clay loam from the subsoil. The subsoil is firm clay loam about 43 inches thick. The upper part is strong brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In places the surface layer is strong brown clay loam.

Included with this soil in mapping are small areas of the moderately well drained Armstrong soils on the upper part of side slopes. These soils have a red subsoil that is higher in clay content than the Gara soil and are seepy during wet periods. They make up about 5 percent of the unit.

Permeability of this Gara soil is moderately slow, 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 low supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

Many areas are used for cultivated crops. Some are used for pasture or hay. A few support native hardwoods. This soil generally is unsuited to cultivated crops because further erosion is a hazard. It is

moderately well suited to grasses and legumes for hay and pasture.

A cover of pasture plants or hay is effective in controlling erosion. 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.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are the main management concerns. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when this equipment is operated. Areas that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

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 upland side slopes. Areas range from 5 to 40 acres in size. They are irregularly shaped or elongated.

Typically, the surface layer is strong brown clay loam about 6 inches thick. It contains some streaks and pockets of very dark grayish brown loam from the original surface soil. The subsoil is firm clay loam about 39 inches thick. The upper part is strong brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In places the surface layer is very dark grayish brown loam.

Included with this soil in mapping are small areas of the moderately well drained Armstrong soils on the upper part of side slopes. These soils have a red subsoil that is higher in clay content than the Gara soil and are seepy during wet periods. They make up about 5 percent of the unit.

Permeability of this Gara soil is moderately slow, and runoff is rapid. 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 low supply of available phosphorus and a very low supply of available potassium. Tilth is poor.

Some areas are used for cultivated crops. Most are used for pasture or hay. Most have been cultivated in the past. This soil generally is unsuited to cultivated crops because of the slope and a severe hazard of erosion. It is poorly suited to grasses and legumes for hay and pasture. The surface layer tends to form a crust when the soil is worked. As a result, the rate of water infiltration is reduced and the rate of runoff is increased. The increased runoff rate accelerates sheet and gully erosion.

A cover of pasture plants or hay is effective in controlling erosion. Overgrazing causes surface compaction, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, and timely deferment of grazing, especially during wet periods, help to keep the pasture in good condition.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are the main management concerns. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when this equipment is operated. Areas that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIe.

179F2—Gara loam, 18 to 25 percent slopes, moderately eroded. This steep, well drained soil is on upland side slopes. Areas range from 5 to 20 acres in size. They are irregularly shaped or elongated.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. It is mixed with some streaks and pockets of strong brown clay loam from the subsoil. The subsoil is firm clay loam about 43 inches thick. The upper part is strong brown, and the lower part is strong brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In places the surface layer is yellowish brown clay loam.

Included with this soil in mapping are small areas of the moderately well drained Armstrong soils on the upper part of side slopes. These soils have a red subsoil that is higher in clay content than the Gara soil and are seepy during wet periods. They make up about 5 percent of the unit.

Permeability of this Gara soil is moderately slow, 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 low supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

Although formerly cultivated, most areas are in permanent pasture. Some of the smaller areas are farmed along with areas of adjoining soils. A few areas support native hardwoods. This soil generally is unsuited to cultivated crops because of the slope and a severe hazard of erosion. It is poorly suited to grasses and legumes for hay and pasture. Operating farm

machinery is difficult because of the slope, gullies, and waterways. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture.

A cover of pasture plants is effective in controlling erosion. Overgrazing causes surface compaction, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, and timely deferment of grazing, especially during wet periods, help to keep the pasture in good condition.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are the main management concerns. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Areas that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIIe.

179F3—Gara clay loam, 18 to 25 percent slopes, severely eroded. This steep, well drained soil is on upland side slopes. Areas range from 5 to 20 acres in size. They are irregularly shaped or elongated.

Typically, the surface layer is strong brown clay loam about 6 inches thick. It contains some streaks and pockets of very dark grayish brown loam from the original surface soil. The subsoil is firm clay loam about 39 inches thick. The upper part is strong brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In places the surface layer is very dark grayish brown loam.

Included with this soil in mapping are small areas of the moderately well drained Armstrong soils on the upper part of side slopes. These soils have a red subsoil that is higher in clay content than the Gara soil and are seepy during wet periods. They make up about 5 percent of the unit.

Permeability of this Gara soil is moderately slow, and runoff is rapid. 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 low supply of available phosphorus and a very low supply of available potassium. Tilth is poor.

Although formerly cultivated, most areas are in permanent pasture. Some of the smaller areas are farmed along with adjoining soils. This soil generally is unsuited to cultivated crops because of the slope and a severe hazard of erosion. It is poorly suited to grasses and legumes for hay and pasture. Operating farm machinery is difficult because of the slope, gullies, and waterways. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture.

A cover of pasture plants is effective in controlling erosion. Overgrazing causes surface compaction, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, and timely deferment of grazing, especially during wet periods, help to keep the pasture in good condition.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are the main management concerns. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Areas that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIIe.

220—Nodaway silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is in areas of recent deposition on bottom land. It is frequently flooded for very brief or brief periods unless it is protected. Areas range from 5 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The substratum is stratified silt loam about 47 inches thick. The upper part is dark grayish brown, very dark grayish brown, and grayish brown; and the lower part is grayish brown and dark grayish brown and is mottled. Below the substratum to a depth of about 60 inches is an older, buried surface layer of black, mottled silt loam. In places the buried surface layer is below a depth of 60 inches.

Included with this soil in mapping are small areas of the poorly drained Ackmore and Colo soils. Ackmore and Colo soils are in landscape positions similar to those of the Nodaway soil. They have a higher content of organic matter in the surface layer than the Nodaway soil. Colo soils have a surface layer of silty clay loam. Included soils make up about 5 to 10 percent of the unit.

Permeability of this Nodaway soil is moderate, and runoff is slow. Available water capacity is very high. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 1.5 to 2.5 percent. The substratum generally has a medium supply of available phosphorus and a very low or low supply of potassium. Tilth is fair.

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

legumes for hay and pasture. Wetness is a limitation because of the flooding and the seasonal high water table. Measures that help to overcome the wetness improve the timeliness of fieldwork. 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.

If this soil is used for pasture, overgrazing or grazing during wet periods causes surface compaction and poor tilth and reduces forage production. Proper stocking rates, pasture rotation, and timely deferment of grazing, especially during wet periods, help to keep the pasture in good condition.

The land capability classification is IIw.

222D2—Clarinda silty clay loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, poorly drained soil is on short, convex side slopes and in coves at the head of drainageways in the uplands. Areas range from 5 to 20 acres in size. They are elongated or irregular in shape.

Typically, the surface layer is very dark grayish brown silty clay loam about 6 inches thick. It is mixed with some streaks and pockets of brown material from the subsoil. The subsoil extends to a depth of about 60 inches. The upper part is brown, friable silty clay loam, the next part is gray, mottled, firm clay, and the lower part is olive gray, mottled, firm clay loam.

Included with this soil in mapping are small areas of the well drained Killduff soils on the upper part of side slopes. These soils formed in deoxidized loess and have a lower content of clay in the subsoil than the Clarinda soil. They make up about 5 to 10 percent of the unit.

Permeability is very slow in the clayey part of the subsoil of this Clarinda soil. As a result, seepage is likely. Runoff is rapid. Available water capacity is moderate. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 2.2 to 3.2 percent. The shrink-swell potential is high. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is generally fair.

Most areas are cultivated. Some are used for hay or pasture. Most of the smaller areas of this soil are farmed along with the adjoining soils. This soil is poorly suited to corn, soybeans, and small grain and is moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, wetness is a very serious limitation. Further erosion is a hazard. It can be controlled 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 constructed, cuts should not be so deep that they expose the clayey part of the subsoil. Installing interceptor tiles in the more permeable soils upslope reduces the wetness in many areas of this soil. Returning crop residue to the soil or regularly adding other organic material and deferring tillage when the soil is wet improve fertility and tilth.

A cover of pasture plants or hay is effective in controlling erosion. 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.

226—Lawler loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on alluvial terraces. Areas range from 5 to 20 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown loam about 7 inches thick. The subsurface layer is very dark grayish brown loam about 4 inches thick. The subsoil is about 24 inches thick. It is mottled and friable. The upper part is olive brown loam, the next part is light olive brown loam, and the lower part is yellowish brown sandy loam. The substratum to a depth of about 60 inches is yellowish brown sand. In places the loam extends to a depth of 40 inches.

Permeability is moderate in the subsoil and very rapid in the substratum. Runoff is slow. Available water capacity is moderate. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 4 to 5 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is good.

Most areas are used for cultivated crops. Some are in permanent pasture. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Droughtiness is a limitation during periods of below average rainfall. The water table is moderately high in the spring but drops rapidly during the growing season. In places a tile drainage system is beneficial during wet periods, but installing the tile is difficult because of the loose, water-bearing sand and gravel. In some areas suitable outlets for tile are not readily available. If cultivated areas are plowed in the fall, erosion is a hazard unless the surface is protected. A system of conservation tillage that leaves crop residue on the surface helps to control 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.

A cover of pasture plants or hay improves soil

aeration and tilth. Overgrazing 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.

269—Humeston silt loam, 0 to 2 percent slopes. This nearly level, very poorly drained soil is on slightly concave foot slopes and in depressions on stream terraces. It is subject to flooding or ponding. Areas range from 5 to 40 acres in size. They are irregularly shaped, oval, or round.

Typically, the surface layer is black silt loam about 6 inches thick. The subsurface layer is silt loam about 22 inches thick. The upper part is very dark gray, and the lower part is dark gray. The subsoil extends to a depth of about 60 inches. It is firm. The upper part is very dark gray silty clay loam, the next part is very dark gray, mottled silty clay, and the lower part is dark gray, mottled silty clay.

Permeability is very slow, and runoff is very slow or ponded. Available water capacity is high. The soil has a seasonal high water table. The content of organic matter is about 3 to 4 percent in the surface layer. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

This soil is used for cultivated crops, hay, or pasture. It is moderately well suited to corn, soybeans, and small grain. If the soil is drained, row crops can be grown in many years. Tile drains generally do not function satisfactorily, and flooding limits their use in the lower areas. Open ditches, surface drains, and land shaping help to remove surface water. The soil warms up slowly in the spring and dries out slowly after periods of rainfall. In years when rainfall is heavy, planting is delayed. Because the soil cannot be easily managed, fieldwork should be timely.

This soil is moderately well suited to grasses and legumes for hay and pasture. Permanent pastures can be improved if they are renovated and reseeded. Overgrazing or grazing when the soil is wet causes surface compaction and results in 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 IIIw.

291—Atterberry silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on broad ridgetops in the uplands. Areas range from 5 to 20 acres in size. They are round, oval, or irregular in shape.

Typically, the surface layer is very dark gray silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is mottled, friable silty clay loam about 30 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 light brownish gray, mottled silt loam.

Included with this soil in mapping are small areas of poorly drained soils on the lower part of ridgetops. Fieldwork is delayed in these areas for several days during wet periods unless tile drains are installed. Included soils make up less than 5 percent of the unit.

Permeability of this Atterberry soil is moderate, and runoff is slow. The soil has a seasonal high water table. Available water capacity is high or very 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. Tilth is good.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain. The seasonal high water table often delays fieldwork in spring and during other wet periods. Installing drainage tile improves the timeliness of fieldwork. 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. Overgrazing 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.

This soil is well suited to trees. It has a seasonal high water table, however, and remains wet for some time after periods of rainfall. Seedlings survive and grow well if competing vegetation is controlled by carefully preparing the site or by spraying or cutting.

The land capability classification is I.

293D—Chelsea-Lamont-Fayette complex, 9 to 14 percent slopes. These strongly sloping, excessively drained and well drained soils are on upland ridges and side slopes. Areas range from 5 to 40 acres in size and are irregularly shaped. They are about 50 percent Chelsea soil, 30 percent Lamont soil, and 20 percent Fayette soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Chelsea soil is very dark gray loamy fine sand about 4 inches thick. The subsurface layer is about 38 inches thick. The upper part is brown loamy fine sand, the next part is yellowish brown fine sand, and the lower part is brownish yellow,

mottled fine sand. The subsoil to a depth of about 60 inches is light yellowish brown, loose sand that has lamellae of strong brown sandy loam.

Typically, the surface layer of the Lamont soil is very dark gray fine sandy loam about 4 inches thick. The subsurface layer is dark grayish brown fine sandy loam about 10 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is yellowish brown, very friable fine sandy loam, the next part is brownish yellow, very friable fine sandy loam, and the lower part is brownish yellow, loose loamy fine sand that has lamellae of strong brown sandy loam.

Typically, the surface layer of the Fayette soil is very dark gray silt loam about 3 inches thick. The subsurface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is friable silty clay loam about 37 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam.

Permeability is rapid in the Chelsea soil, moderately rapid in the Lamont soil, and moderate in the Fayette soil. 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 about 0.4 to 1.5 percent in the surface layer of the Chelsea and Lamont soils and 2 to 3 percent in the surface layer of the Fayette soil. The supply of available phosphorus in the subsoil is very low in the Chelsea soil, low in the Lamont soil, and high in the Fayette soil. The supply of available potassium is low or very low in the subsoil of all three soils. Tilth is poor.

Most areas are wooded. Some are pastured. These soils are poorly suited to corn, soybeans, and small grain. They are moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. It can be controlled by contour farming, terraces, conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. Terraces can be difficult to construct and maintain because of poor stability of the sand in the Chelsea and Lamont soils. Returning crop residue to the soils or regularly adding other organic material and deferring tillage when the soils are wet help to maintain tilth, improve fertility, prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay is effective in controlling erosion. 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.

These soils are well suited to trees. The hazard of erosion and the equipment limitation are slight. Seedling mortality is slight on the Lamont and Fayette soils and moderate on the Chelsea soil. Seedlings should be planted closer together on the Chelsea soil, and the stand of surviving seedlings should be thinned to help provide adequate growing space. No major hazards or limitations affect planting or harvesting if suitable species are selected for planting and the stand is managed properly.

The land capability classification is IVe.

293D2—Chelsea-Lamont-Fayette complex, 9 to 14 percent slopes, moderately eroded. These strongly sloping, excessively drained soils are on upland ridges and side slopes. Areas range from 5 to 80 acres in size and are irregularly shaped. They are about 50 percent Chelsea soil, 30 percent Lamont soil, and 20 percent Fayette soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Chelsea soil is dark grayish brown loamy fine sand about 6 inches thick. It is mixed with some streaks and pockets of yellowish brown fine sand from the subsurface layer. The subsurface layer is fine sand about 35 inches thick. The upper part is yellowish brown, and the lower part is brownish yellow and mottled. The subsoil to a depth of about 60 inches is light yellowish brown, loose sand that has lamellae of strong brown, loose sandy loam.

Typically, the surface layer of the Lamont soil is dark grayish brown fine sandy loam about 6 inches thick. It includes some streaks and pockets of yellowish brown material from the subsoil. The subsoil extends to a depth of about 60 inches. The upper part is yellowish brown, very friable fine sandy loam, the next part is brownish yellow, very friable fine sandy loam, and the lower part is brownish yellow, loose loamy fine sand that has lamellae of strong brown sandy loam.

Typically, the surface layer of the Fayette soil is dark grayish brown silt loam about 6 inches thick. It includes some streaks and pockets of yellowish brown silty clay loam from the subsoil. The subsoil is friable silty clay loam about 35 inches thick. The upper 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, mottled silt loam.

Permeability is rapid in the Chelsea soil, moderately rapid in the Lamont soil, and moderate in the Fayette soil. 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 0.4 to 1.5 percent in the surface layer of the Chelsea and Lamont soils and 1.5 to 2.5 percent in the surface layer of the Fayette soil. The supply of

available phosphorus in the subsoil is very low in the Chelsea soil, low in the Lamont soil, and high in the Fayette soil. The supply of available potassium is low or very low in the subsoil of all three soils. Tilth is poor.

Most areas are used for cultivated crops. Some are pastured. These soils are poorly suited to corn, soybeans, and small grain. They are moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. Terraces can be difficult to construct and maintain because of poor stability of the sand in the Chelsea and Lamont soils. Returning crop residue to the soils or regularly adding other organic material and deferring tillage when the soils are wet help to maintain tilth, improve fertility, prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants is effective in controlling erosion. Overgrazing causes surface compaction, 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.

These soils are well suited to trees. The hazard of erosion and the equipment limitation are slight. Seedling mortality is slight on the Lamont and Fayette soils and moderate on the Chelsea soil. Seedlings should be planted closer together on the Chelsea soil, and the stand of surviving seedlings should be thinned to help provide adequate growing space. No major hazards or limitations affect planting or harvesting if suitable species are selected for planting and the stand is managed properly.

The land capability classification is IVe.

293E—Chelsea-Lamont-Fayette complex, 14 to 18 percent slopes. These moderately steep, excessively drained and well drained soils are on upland side slopes. Areas range from 10 to 40 acres in size and are irregularly shaped. They are about 50 percent Chelsea soil, 30 percent Lamont soil, and 20 percent Fayette soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Chelsea soil is very dark gray loamy fine sand about 4 inches thick. The subsurface layer is about 38 inches thick. The upper part is brown loamy fine sand, the next part is yellowish brown fine sand, and the lower part is brownish yellow, mottled fine sand. The subsoil to a depth of about 60 inches is light yellowish brown, loose loamy sand that has lamellae of strong brown sandy loam in the lower part.

Typically, the surface layer of the Lamont soil is very dark gray fine sandy loam about 4 inches thick. The subsurface layer is dark grayish brown fine sandy loam about 10 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is yellowish brown, very friable fine sandy loam, the next part is brownish yellow, very friable fine sandy loam, and the lower part is brownish yellow, loose loamy fine sand that has lamellae of strong brown sandy loam.

Typically, the surface layer of the Fayette soil is very dark gray silt loam about 3 inches thick. The subsurface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is friable silty clay loam about 37 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam.

Permeability is rapid in the Chelsea soil, moderately rapid in the Lamont soil, and moderate in the Fayette soil. 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 0.4 to 1.5 percent in the surface layer of the Chelsea and Lamont soils and 2.0 to 3.0 percent in the surface layer of the Fayette soil. The supply of available phosphorus in the subsoil is very low in the Chelsea soil, low in the Lamont soil, and high in the Fayette soil. The supply of available potassium is low or very low in the subsoil of all three soils. Tilth is poor.

Most areas are wooded. Some are pastured. These soils generally are unsuited to corn, soybeans, and small grain. They are moderately well suited to grasses and legumes for hay and pasture. Operating farm machinery is difficult because of gullies and waterways.

A cover of pasture plants is effective in controlling erosion. Overgrazing causes surface compaction, 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.

These soils are moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Seedling mortality is slight on the Lamont and Fayette soils and moderate on the Chelsea soil. Seedlings should be planted closer together on the Chelsea soil, and the stand of surviving seedlings should be thinned to help provide adequate growing

space. Areas that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIe.

293E2—Chelsea-Lamont-Fayette complex, 14 to 18 percent slopes, moderately eroded. These moderately steep, excessively drained and well drained soils are on upland side slopes. Areas range from 10 to 40 acres in size and are irregularly shaped. They are about 50 percent Chelsea soil, 30 percent Lamont soil, and 20 percent Fayette soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Chelsea soil is dark grayish brown loamy sand about 6 inches thick. It is mixed with some streaks and pockets of yellowish brown fine sand from the subsurface layer. The subsurface layer is fine sand about 35 inches thick. The upper part is yellowish brown, and the lower part is brownish yellow and mottled. The subsoil to a depth of about 60 inches is light yellowish brown, loose sand that has lamellae of strong brown sandy loam.

Typically, the surface layer of the Lamont soil is dark grayish brown fine sandy loam about 6 inches thick. It is mixed with some streaks and pockets of yellowish brown material from the subsoil. The subsoil extends to a depth of about 60 inches. The upper part is yellowish brown, very friable fine sandy loam, the next part is brownish yellow, very friable fine sandy loam, and the lower part is brownish yellow, loose loamy fine sand that has lamellae of strong brown sandy loam.

Typically, the surface layer of the Fayette soil is dark grayish brown silt loam about 6 inches thick. It is mixed with some streaks and pockets of yellowish brown silty clay loam from the subsoil. The subsoil is friable silty clay loam about 35 inches thick. The upper 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, mottled silt loam.

Permeability is rapid in the Chelsea soil, moderately rapid in the Lamont soil, and moderate in the Fayette soil. 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 about 0.4 to 1.5 percent in the surface layer of the Chelsea and Lamont soils and 1.5 to 2.5 percent in the surface layer of the Fayette soil. The supply of available phosphorus in the subsoil is very low in the Chelsea soil, low in the Lamont soil, and high in the Fayette soil. The supply of available potassium is low or very low in the subsoil of all three soils. Tilth is poor.

Some areas are used for cultivated crops. Most are in pasture or are wooded. Almost all of the areas have been previously cultivated. These soils generally are unsuited to corn, soybeans, and small grain. They are moderately well suited to grasses and legumes for hay and pasture. Operating farm machinery is difficult because of the slope, gullies, and waterways. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture.

A cover of pasture plants is effective in controlling erosion. Overgrazing causes surface compaction, 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.

These soils are moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Seedling mortality is slight on the Lamont and Fayette soils and moderate on the Chelsea soil. Seedlings should be planted closer together on the Chelsea soil, and the stand of surviving seedlings should be thinned to help provide adequate growing space.

The land capability classification is VIe.

293F—Chelsea-Lamont-Fayette complex, 18 to 25 percent slopes. These steep, excessively drained and well drained soils are on upland side slopes. Areas range from 10 to 40 acres in size and are irregularly shaped. They are about 50 percent Chelsea soil, 30 percent Lamont soil, and 20 percent Fayette soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Chelsea soil is very dark gray loamy fine sand about 4 inches thick. The subsurface layer is about 35 inches thick. The upper part is brown loamy fine sand, the next part is yellowish brown fine sand, and the lower part is brownish yellow, mottled fine sand. The subsoil to a depth of about 60 inches is light yellowish brown, loose loamy sand that has lamellae of strong brown sandy loam.

Typically, the surface layer of the Lamont soil is very dark gray fine sandy loam about 4 inches thick. The subsurface layer is dark grayish brown fine sandy loam about 10 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is yellowish brown, very friable fine sandy loam, and the lower part is brownish yellow, loose loamy fine sand that has lamellae of strong brown sandy loam.

Typically, the surface layer of the Fayette soil is very dark gray silt loam about 3 inches thick. The subsurface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is friable silty clay loam about 37 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam.

Permeability is rapid in the Chelsea soil, moderately rapid in the Lamont soil, and moderate in the Fayette soil. 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 about 0.4 to 1.5 percent in the surface layer of the Chelsea and Lamont soils and 2.0 to 3.0 percent in the surface layer of the Fayette soil. The supply of available phosphorus in the subsoil is very low in the Chelsea soil, low in the Lamont soil, and high in the Fayette soil. The supply of available potassium is low or very low in the subsoil of all three soils. Tilth is poor.

Most areas are wooded. Some are pastured. These soils generally are unsuited to corn, soybeans, and small grain. They are low in fertility, droughty, and too steep to be used for these crops. They are poorly suited to grasses and legumes for hay and pasture. Operating farm machinery is difficult because of the slope, gullies, and waterways.

A cover of pasture plants is effective in controlling erosion. Overgrazing causes surface compaction, 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.

These soils are moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Seedling mortality is slight on the Lamont and Fayette soils and moderate on the Chelsea soil. Seedlings should be planted closer together on the Chelsea soil, and the stand of surviving seedlings should be thinned to help provide adequate growing space. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIIe.

293F2—Chelsea-Lamont-Fayette complex, 18 to 25 percent slopes, moderately eroded. These steep, excessively drained and well drained soils are on upland side slopes. Areas range from 5 to 40 acres in size and are irregularly shaped. They are about 50 percent Chelsea soil, 30 percent Lamont soil, and 20 percent Fayette soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Chelsea soil is very dark gray loamy fine sand about 6 inches thick. It is mixed with some streaks and pockets of yellowish brown fine sand from the subsurface layer. The subsurface layer is fine sand about 35 inches thick. The upper part is yellowish brown, and the lower part is brownish yellow and mottled. The subsoil to a depth of about 60 inches is light yellowish brown, loose sand that has lamellae of strong brown sandy loam.

Typically, the surface layer of the Lamont soil is dark grayish brown fine sandy loam about 6 inches thick. It includes streaks and pockets of yellowish brown material from the subsoil. The subsoil extends to a depth of about 60 inches. The upper part is yellowish brown, very friable fine sandy loam, and the lower part is brownish yellow, loose loamy fine sand that has lamellae of strong brown sandy loam.

Typically, the surface layer of the Fayette soil is dark grayish brown silt loam about 6 inches thick. It includes streaks and pockets of yellowish brown material from the subsoil. The subsoil is friable silty clay loam about 37 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam.

Permeability is rapid in the Chelsea soil, moderately rapid in the Lamont soil, and moderate in the Fayette soil. 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 about 0.4 to 1.5 percent in the surface layer of the Chelsea and Lamont soils and 1.5 to 2.5 percent in the surface layer of the Fayette soil. The supply of available phosphorus in the subsoil is very low in the Chelsea soil, low in the Lamont soil, and high in the Fayette soil. The supply of available potassium is low or very low in the subsoil of all three soils. Tilth is poor.

Some areas are used for cultivated crops. Some are pastured. Almost all of the areas have been previously cultivated. These soils generally are unsuited to corn, soybeans, and small grain. They are moderately well suited to grasses and legumes for hay and pasture. Operating farm machinery is difficult because of the slope, gullies, and waterways. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture.

A cover of pasture plants is effective in controlling erosion. Overgrazing causes surface compaction, 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.

These soils are moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Seedling mortality is slight on the Lamont and Fayette soils and moderate on the Chelsea soil. Seedlings should be planted closer together on the Chelsea soil, and the stand of surviving seedlings should be thinned to help provide adequate growing space. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIIe.

293G—Chelsea-Lamont-Fayette complex, 24 to 40 percent slopes. These very steep, excessively drained and well drained soils are on upland side slopes. Areas range from 10 to 60 acres in size and are irregularly shaped. They are about 45 percent Chelsea soil, 30 percent Lamont soil, and 20 percent Fayette soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Chelsea soil is very dark gray loamy sand about 4 inches thick. The subsurface layer is about 38 inches thick. The upper part is brown loamy fine sand, the next part is yellowish brown fine sand, and the lower part is brownish yellow, mottled fine sand. The subsoil to a depth of about 60 inches is light yellowish brown, loose loamy sand that has lamellae of strong brown sandy loam.

Typically, the surface layer of the Lamont soil is very dark gray fine sandy loam about 4 inches thick. The subsurface layer is dark grayish brown fine sandy loam about 10 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is yellowish brown, very friable fine sandy loam, the next part is brownish yellow, very friable fine sandy loam, and the lower part is brownish yellow, loose loamy fine sand that has lamellae of strong brown sandy loam.

Typically, the surface layer of the Fayette soil is very dark gray silt loam about 3 inches thick. The subsurface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is friable silty clay loam about 37 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam.

Included with these soils in mapping are small areas of Lindley soils on the lower part of side slopes. Lindley soils formed in glacial till and have a subsoil of firm clay loam. They make up about 5 percent of the unit.

Permeability is rapid in the Chelsea soil, moderately rapid in the Lamont soil, and moderate in the Fayette soil. 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 about 0.4 to 1.5 percent in the surface layer of the Chelsea and Lamont soils and 2.0 to 3.0 percent in the surface layer of the Fayette soil. The supply of available phosphorus in the subsoil is very low in the Chelsea soil, low in the Lamont soil, and high in the Fayette soil. The supply of available potassium is low or very low in the subsoil of all three soils. Tilth is poor.

Nearly all areas are wooded or are in permanent pasture. These soils are moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Seedling mortality is slight on the Lamont and Fayette soils and moderate on the Chelsea soil. Seedlings should be planted closer together on the Chelsea soil, and the stand of surviving seedlings should be thinned to help provide adequate growing space. Areas that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIIe.

350—Waukegan silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on stream terraces along rivers and major streams. Areas range from 5 to 40 acres in size. They are circular or irregular in shape.

Typically, the surface layer is very dark brown silt loam about 7 inches thick. The subsurface layer is very dark grayish brown silt loam about 5 inches thick. The subsoil is about 23 inches thick. It is friable. The upper part is brown and dark brown silt loam, the next part is dark yellowish brown silt loam, and the lower part is yellowish brown loam. The substratum to a depth of about 60 inches is yellowish brown loamy sand that has a 10 to 15 percent content of gravel. In places the upper part of the substratum is silt loam.

Included with this soil in mapping are small areas of

soils that are sandy at a depth of about 20 inches. These soils are on slight rises or escarpments next to bottom land. They have a lower content of organic matter in the surface layer than the Waukegan soil and a lower available water capacity. They make up about 5 percent of the unit.

Permeability is moderate in the upper part of this Waukegan soil and rapid in the lower part. Runoff is slow. Available water capacity is moderate. The content of organic matter in the surface layer is about 3.5 to 4.5 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is good.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Because the available water capacity is moderate, this soil can be droughty. 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.

If this soil is used for pasture, overgrazing or grazing during wet periods causes surface compaction and reduces the rate of water infiltration. 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.

350B—Waukegan silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on stream terraces along rivers and major streams. Areas range from 5 to 20 acres in size. They are circular or irregular in shape.

Typically, the surface layer is very dark brown silt loam about 7 inches thick. The subsurface layer is very dark grayish brown silt loam about 5 inches thick. The subsoil is about 23 inches thick. It is friable. The upper part is brown and dark brown silt loam, the next part is dark yellowish brown silt loam, and the lower part is yellowish brown loam. The substratum to a depth of about 60 inches is yellowish brown loamy sand that has a 10 to 15 percent content of gravel. In places the upper part of the substratum is silt loam.

Included with this soil in mapping are small areas of soils that are sandy within a depth of 20 inches. These soils are on slight rises or escarpments next to bottom land. They have a lower content of organic matter in the surface layer than the Waukegan soil and a lower available water capacity. They make up about 5 percent of the unit.

Permeability is moderate in the upper part of this Waukegan 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 about 3 to 4 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is good.

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, the hazard of erosion is slight. A system of conservation tillage that leaves crop residue on the surface and crop rotations that include meadow crops help to control erosion. Contour farming and terracing are difficult because the slopes are short and complex. Terracing can expose the coarse textured substratum. The exposed substratum has a very low available water capacity and is very droughty. 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.

If this soil is used for pasture, overgrazing or grazing during wet periods causes surface compaction and reduces the rate of water infiltration. 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.

350C—Waukegan silt loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on escarpments of stream terraces along the major streams. Areas range from 5 to 40 acres in size. They are long and narrow.

Typically, the surface layer is very dark brown silt loam about 7 inches thick. The subsurface layer is very dark grayish brown silt loam about 5 inches thick. The subsoil is about 23 inches thick. It is friable. The upper part is brown and dark brown silt loam, the next part is dark yellowish brown silt loam, and the lower part is yellowish brown loam. The substratum to a depth of about 60 inches is yellowish brown loamy sand that has a 10 to 15 percent content of gravel.

Included with this soil in mapping are small areas of soils that are sandy within a depth of 20 inches and areas of soils that have a surface layer of gravelly loamy sand. The included soils are in landscape positions similar to those of the Waukegan soil. They have a lower content of organic matter in the surface layer than the Waukegan soil and have a lower available water capacity. They make up about 5 to 10 percent of the unit.

Permeability is moderate in the upper part of this Waukegan 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 about 3 to 4 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is good.

Most areas are used for cultivated crops. Some areas of this soil are pastured along with areas of adjoining soils on bottom land. This soil is moderately well suited to corn, soybeans, and small grain. It 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 and crop rotations that include meadow crops. Contour farming and terracing are difficult because of the short slopes. Terracing can expose the coarse textured substratum. The exposed substratum has a very low available water capacity and is very droughty. 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.

If this soil is used for pasture, overgrazing or grazing during wet periods causes surface compaction and reduces the rate of water infiltration. 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.

354—Aquolls, ponded. These very poorly drained soils are in depressional areas on flood plains and in low areas adjacent to major rivers and their tributaries. They are subject to ponding by runoff from adjacent areas. Slopes generally are 0 to 2 percent. The dominant acreage of this map unit is about 2 miles west of Chelsea, Iowa, on the Otter Creek and Iowa River flood plain. It is about 1,500 acres in size. It is commonly known as Otter Creek Marsh. Other areas of this unit range from 5 to 20 acres in size. They are irregularly shaped.

Typically, the surface layer is black mucky silty clay loam and silt loam about 10 inches thick. The subsurface layer is black and very dark gray silty clay loam about 34 inches thick. The substratum to a depth of about 60 inches is very dark gray silty clay loam and silt loam.

Permeability varies but generally is moderately slow or very slow. Runoff is very slow or ponded. Available water capacity generally is high. In most areas, ponds are evident or the water table is at or near the surface throughout the year. The content of organic matter in the surface layer is about 15 percent. The subsoil generally has a very low supply of available phosphorus and potassium.

Most of the acreage is idle land or is used as wildlife habitat. These soils generally are suited to wetland wildlife habitat. They 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 in the uplands. Areas range from 5 to more than 100 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown silty clay loam about 7 inches thick. The subsurface layer is very dark brown and very dark grayish brown silty clay loam about 13 inches thick. The subsoil is about 33 inches thick. The upper part is dark yellowish brown, friable silty clay loam, and the lower part is dark yellowish brown, mottled, firm loam. The substratum to a depth of about 60 inches is dark yellowish brown and yellowish brown, mottled loam. In some places a line of stones or a layer of sand separates the loess from the underlying firm glacial till. In other places the glacial till is at a depth of more than 40 inches.

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 generally has a very low supply of available phosphorus and potassium. Tilth is good.

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. If cultivated crops are grown, erosion is a hazard. It can be controlled by contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 controlling erosion. Overgrazing 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.

377B2—Dinsdale silty clay loam, 2 to 5 percent slopes, moderately eroded. This gently sloping, well drained soil is on narrow ridges in the uplands. Areas range from 5 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown silty clay loam about 7 inches thick. It is mixed with some

streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is about 30 inches thick. The upper part is dark yellowish brown, friable silty clay loam, and the lower part is dark yellowish brown, firm loam. The substratum to a depth of about 60 inches is dark yellowish brown and yellowish brown, mottled loam. In places a line of stones or a layer of sand may separate the loess from the underlying firm glacial till.

Permeability is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is about 2.2 to 3.2 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is fair.

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. It can be controlled by contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 controlling erosion. Overgrazing causes surface compaction and poor tilth, increases the runoff rate, and reduces forage production. 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 ridgetops and 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 brown silty clay loam about 7 inches thick. The subsurface layer is very dark brown and very dark grayish brown silty clay loam about 13 inches thick. The subsoil is about 33 inches thick. The upper part is dark yellowish brown, friable silty clay loam, and the lower part is dark yellowish brown, mottled, firm loam. The substratum to a depth of about 60 inches is dark yellowish brown and yellowish brown, mottled loam. In some places a line of stones or a sand lens separates the loess and the underlying glacial till. In other places the glacial till is at a depth of more than 40 inches.

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 generally has a very low supply of available phosphorus and potassium. Tilth is good.

Most areas are cultivated. This soil is moderately well suited to corn, soybeans, and small grain. It 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 contour farming, terracing, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. The less fertile, firm glacial till should not be exposed if the soil is terraced. 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 controlling erosion. Overgrazing 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 upland ridgetops and side slopes. Areas range from 15 to 100 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown silty clay loam about 7 inches thick. It is mixed with some streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is about 30 inches thick. The upper part is dark yellowish brown, friable silty clay loam, and the lower part is yellowish brown, mottled, firm loam. The substratum to a depth of about 60 inches is yellowish brown, mottled loam. In places a line of stones or a layer of sand separates the loess from the underlying firm glacial till.

Included with this soil in mapping are small areas of Dickinson and Liscomb soils. Dickinson soils are fine sandy loam in the upper part of the profile. Liscomb soils are loam. They formed in glacial till. The included soils are in landscape positions similar to those of the Dinsdale soil. They make up about 5 to 10 percent of the unit.

Permeability of this Dinsdale soil is moderate, and runoff is medium. Available water capacity is high. The content of organic matter in the surface layer is about 2.2 to 3.2 percent. The surface layer generally has a very low supply of available phosphorus and potassium. Tilth is fair.

Most areas are used for cultivated crops. Some are used for pasture. The soil is moderately well suited to corn, soybeans, and small grain. It 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 by contour farming, terraces, a system of conservation tillage that leaves crop residue on the

surface, and crop rotations that include meadow crops. The less productive underlying till should be exposed as little as possible when terraces are constructed. 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 controlling erosion. 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 IIIe.

377D2—Dinsdale silty clay loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is on upland side slopes. Areas range from 5 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown silty clay loam about 7 inches thick. It is mixed with some streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is about 30 inches thick. The upper part is dark yellowish brown, 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, mottled loam. In places a line of stones or a layer of sand separates the loess from the underlying firm glacial till.

Included with this soil in mapping are small areas of Dickinson and Liscomb soils. Dickinson soils are fine sandy loam in the upper part of the profile. The included soils are in landscape positions similar to those of the Dinsdale soil. They make up about 5 to 10 percent of the unit.

Permeability of this Dinsdale soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 2.2 to 3.2 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is fair.

Most areas are used for cultivated crops. Some are used for pasture. This soil is moderately well suited to corn, soybeans, and small grain. It 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 by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. The less productive underlying till should be exposed as little as possible when terraces are constructed. 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 controlling erosion. 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 IIIe.

377D3—Dinsdale silty clay loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, well drained soil is on upland side slopes. Areas range from 5 to 20 acres in size and are irregularly shaped.

Typically, the surface layer is brown silty clay loam about 6 inches thick. It contains some streaks and pockets of very dark brown material from the original surface soil. The subsoil is about 25 inches thick. The upper part is dark yellowish brown, friable silty clay loam, and the lower part is dark yellowish brown, mottled, firm loam. The substratum to a depth of about 60 inches is yellowish brown, mottled loam. In some places a line of stones or a layer of sand separates the loess from the underlying firm glacial till. In other places the firm loam is within a depth of 24 inches.

Included with this soil in mapping are small areas of Dickinson soils. These soils are in landscape positions similar to those of the Dinsdale soil. They are fine sandy loam in the upper part of the profile. They make up about 5 percent of the unit.

Permeability of this Dinsdale soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 1.2 to 2.2 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is poor.

Most areas are used for cultivated crops. Some large areas are pastured. Most areas of this soil are managed along with areas of adjacent soils. This soil is moderately well suited to row crops grown occasionally in rotation with small grain and grasses and legumes. It is best suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a serious hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. The less productive underlying till should be exposed as little as possible when terraces are constructed. Returning crop residue to the soil or regularly adding other organic material improves tilth and fertility, helps to prevent surface crusting, and increases the rate of water infiltration. More nitrogen generally is needed in areas of this soil than in areas of Dinsdale soils that are not so eroded.

More management also is needed to maintain and improve productivity.

A cover of pasture plants or hay is effective in controlling erosion. Overgrazing 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.

420B—Tama silty clay loam, benches, 2 to 5 percent slopes. This gently sloping, well drained soil is on high, loess-covered terraces along small streams. Areas range from 5 to 20 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown silty clay loam about 6 inches thick. The subsurface layer is very dark brown silty clay loam about 8 inches thick. The subsoil is friable silty clay loam about 31 inches thick. The upper part is very dark grayish brown and brown, and the lower part is dark yellowish brown and yellowish brown and is mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. Coarse sand and gravel are below a depth of 60 inches.

Permeability is moderate, and runoff is medium. Available water capacity is high or very 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. Tilth is good.

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 contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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 IIe.

420C—Tama silty clay loam, benches, 5 to 9 percent slopes. This moderately sloping, well drained soil is on high, loess-covered terraces along small streams. Areas range from 5 to 20 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown silty clay loam about 6 inches thick. The subsurface layer is very dark brown silty clay loam about 8 inches thick. The subsoil is friable silty clay loam about 31 inches thick. The upper part is very dark grayish brown and brown, and the lower part is dark yellowish brown and yellowish brown and is mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. Coarse sand and gravel are below a depth of 60 inches.

Permeability is moderate, and runoff is medium. Available water capacity is high or very 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. Tilth is good.

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 contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. The coarse sand and gravel should not be exposed when terraces are constructed. Returning crop residue to the soil or regularly adding other organic material and deferring tillage when the soil is wet help to prevent surface crusting and increase the rate of water infiltration.

A cover of pasture plants or hay is effective in controlling erosion. 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 IIIe.

424E2—Lindley-Keswick complex, 14 to 18 percent slopes, moderately eroded. These moderately steep, moderately well drained soils are on upland side slopes. The Lindley soil is on the lower part of the side slopes, and the Keswick soil is on the upper part. Areas range from 5 to 30 acres in size and are irregularly shaped. They are about 70 percent Lindley soil and 30 percent Keswick soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Lindley soil is dark grayish brown silt loam about 6 inches thick. It is mixed with some streaks and pockets of dark yellowish brown material from the subsoil. The subsoil is firm clay loam about 36 inches thick. The upper part is dark yellowish brown, the next part is brown and mottled, and the

lower part is strong brown and mottled. The substratum to a depth of about 60 inches is yellowish brown and strong brown, mottled clay loam.

Typically, the surface layer of the Keswick soil is dark grayish brown silt loam about 6 inches thick. It includes some streaks and pockets of brown material from the subsoil. The subsoil is about 44 inches thick. The upper part is dark yellowish brown, friable silt loam and silty clay loam, the next part is strong brown, mottled, firm clay loam, and the lower part is strong brown and grayish brown, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Permeability is moderately slow in the Lindley soil and slow in the Keswick soil. Runoff is rapid on both soils. Available water capacity is high. The Keswick soil has a seasonal high water table. The content of organic matter is about 1.5 to 2.5 percent in the surface layer of both soils. The shrink-swell potential is high in the Keswick soil. The subsoil of the Lindley soil generally has a low supply of available phosphorus and a very low supply of available potassium. The subsoil of the Keswick soil generally has a very low supply of available phosphorus and potassium. Tilth is fair in both soils.

Most areas are used for cultivated crops. Some are used for hay or pasture. These soils generally are unsuited to cultivated crops because further erosion is a hazard and because of the slope. They are moderately well suited to grasses and legumes for hay and pasture.

A cover of pasture plants or hay is effective in controlling erosion. 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, especially during wet periods, help to keep the pasture in good condition.

These soils are moderately well suited to trees. The hazard of erosion, the equipment limitation, and seedling mortality are the main management concerns. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when this equipment is operated. Seedlings should be planted at close intervals because they do not survive and grow well. Thinning the stands helps to provide adequate growing space for the surviving trees. Windthrow is a hazard on the Keswick soil because the root zone is shallow. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIe.

424F2—Lindley-Keswick complex, 18 to 25 percent slopes, moderately eroded. These steep, moderately well drained soils are on upland side slopes. The Lindley soil is on the lower part of the side slopes, and the Keswick soil is on the upper part. Areas range from 5 to 30 acres in size and are irregularly shaped. They are about 70 percent Lindley soil and 30 percent Keswick soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Lindley soil is dark grayish brown loam about 6 inches thick. It is mixed with some streaks and pockets of dark yellowish brown clay loam from the subsoil. The subsoil is firm clay loam about 36 inches thick. The upper part is dark yellowish brown, the next part is brown and mottled, and the lower part is strong brown and mottled. The substratum to a depth of about 60 inches is yellowish brown and strong brown, mottled clay loam.

Typically, the surface layer of the Keswick soil is dark grayish brown silt loam about 6 inches thick. It includes some streaks and pockets of brown material from the subsoil. The subsoil is about 44 inches thick. The upper part is dark yellowish brown, friable silty clay loam, the next part is strong brown, mottled, firm clay loam, and the lower part is strong brown and grayish brown, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Permeability is moderately slow in the Lindley soil and slow in the Keswick soil. Runoff is rapid on both soils. Available water capacity is high. The Keswick soil has a seasonal high water table. The content of organic matter is about 1.5 to 2.5 percent in the surface layer of both soils. The shrink-swell potential is high in the Keswick soil. The subsoil of the Lindley soil generally has a low supply of available phosphorus and a very low supply of available potassium. The subsoil of the Keswick soil generally has a very low supply of available phosphorus and potassium. Tilth is fair in both soils.

Although formerly cultivated, most areas are in permanent pasture. A few are used for cultivated crops. These soils are unsuited to cultivated crops because further erosion is a hazard and slopes are too steep for the use of ordinary farm machinery. They are moderately well suited to grasses and legumes for hay and pasture.

A cover of pasture plants or hay is effective in controlling erosion. 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, especially during wet periods, help to keep the pasture in good condition.

These soils are moderately well suited to trees. The hazard of erosion, the equipment limitation, and seedling mortality are the main management concerns. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when this equipment is operated. Seedlings should be planted at close intervals because they do not survive and grow well. Thinning the stands helps to provide adequate growing space for the surviving trees. Windthrow is a hazard on the Keswick soil because the root zone is shallow. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIIe.

424F3—Lindley-Keswick complex, 18 to 25 percent slopes, severely eroded. These steep, moderately well drained soils are on upland side slopes. The Lindley soil is on the lower part of the side slopes, and the Keswick soil is on the upper part. Areas range from 5 to 20 acres in size and are irregularly shaped. They are about 70 percent Lindley soil and 30 percent Keswick soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Lindley soil is dark yellowish brown clay loam about 5 inches thick. It contains some streaks and pockets of dark grayish brown loam from the original surface soil. The subsoil is firm clay loam about 36 inches thick. The upper part is dark yellowish brown, the next part is brown and mottled, and the lower part is strong brown and mottled. The substratum to a depth of about 60 inches is yellowish brown and strong brown, mottled clay loam.

Typically, the surface layer of the Keswick soil is dark yellowish brown silty clay loam about 5 inches thick. It contains some streaks and pockets of dark grayish brown silt loam from the original surface soil. The subsoil is mottled, firm clay loam about 40 inches thick. The upper part is strong brown, and the lower part is strong brown and yellowish brown. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Permeability is moderately slow in the Lindley soil and slow in the Keswick soil. Runoff is rapid on both soils. Available water capacity is high. The Keswick soil has a seasonal high water table. The content of organic matter is about 0.4 to 2.0 percent in the surface layer of both soils. The shrink-swell potential is high in the Keswick soil. The subsoil of the Lindley soil generally has a low supply of available phosphorus and a very low supply of available potassium. The subsoil of the Keswick soil generally has a very low supply of available phosphorus and potassium. Tilth is poor in both soils.

Most areas are used for pasture and hay but have been cultivated in the past. Some are used for cultivated crops. These soils generally are unsuited to cultivated crops because further erosion is a serious hazard and slopes are too steep for the use of ordinary farm machinery. They are poorly suited to grasses and legumes for hay and pasture.

A cover of pasture plants or hay is effective in controlling erosion. 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, especially during wet periods, help to keep the pasture in good condition.

These soils are moderately well suited to trees. The hazard of erosion, the equipment limitation, and seedling mortality are the main management concerns. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when this equipment is operated. Seedlings should be planted at close intervals because they do not survive and grow well. Thinning the stands helps to provide adequate growing space for the surviving trees. Windthrow is a hazard on the Keswick soil because the root zone is shallow. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIIe.

428B—Ely silty clay loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on foot slopes and in narrow upland waterways. Areas range from 5 to 20 acres in size. They are elongated or irregular in shape.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer is silty clay loam about 21 inches thick. The upper part is black, and the lower part is very dark grayish brown and dark brown. The subsoil is mottled, friable silty clay loam about 15 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.

Included with this soil in mapping are small areas of Judson soils. These soils are in landscape positions similar to those of the Ely soil. They are well drained

and have a brown subsoil. They make up about 5 percent of the unit.

Permeability of this Ely soil is moderate, and runoff is medium. Available water capacity is high. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 4 to 6 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

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 receives runoff from the more sloping soils upslope, and erosion is a hazard if cultivated crops are grown. Diversion terraces divert runoff and minimize siltation from the soils upslope. Erosion can be controlled by contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is effective in controlling erosion. 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 IIe.

429D2—Downs-Lamont complex, 9 to 14 percent slopes, moderately eroded. These strongly sloping, well drained soils are on upland side slopes and ridgetops. Areas range from 10 to 60 acres in size and are irregularly shaped. They are about 60 percent Downs soil and 30 percent Lamont soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Downs soil is very dark grayish brown silt loam about 7 inches thick. It is mixed with some streaks and pockets of brown material from the subsoil. The subsoil is friable silty clay loam about 40 inches thick. The upper 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, mottled silt loam.

Typically, the surface layer of the Lamont soil is dark grayish brown fine sandy loam about 8 inches thick. It includes some steaks and pockets of dark yellowish brown material from the subsoil. The subsoil extends to a depth of about 60 inches. The upper part is dark yellowish brown, very friable fine sandy loam, the next part is yellowish brown, very friable fine sandy loam, and the lower part is brownish yellow, loose loamy fine sand that has lamellae of strong brown sandy loam. The lamellae are 0.5 to 1.0 inch thick. In places the subsoil is silt loam below a depth of 50 inches.

Included with these soils in mapping are small areas of Chelsea and Gara soils. Chelsea soils have a surface layer of loamy sand or sand. They have a lower available water capacity than the Downs and Lamont soils. Gara soils have a surface layer of loam. They formed in glacial till. The included soils are in landscape positions similar to those of the Downs soil. They make up about 10 percent of the unit.

Permeability is moderate in the Downs soil and moderately rapid in the Lamont soil. Runoff is rapid on both soils. Available water capacity is high in the Downs soil and moderate in the Lamont soil. The content of organic matter is about 2.0 to 3.0 percent in the surface layer of the Downs soil and 0.4 to 1.5 percent in the surface layer of the Lamont soil. The subsoil of the Downs and Lamont soils generally has a high to low supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

Most areas are used for cultivated crops. Some are used for pasture. These soils are moderately 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. Soil blowing on the Lamont soil can cause further erosion and may damage crops on it and on the surrounding Downs soil. Contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops help to control erosion. Returning crop residue to the soil or regularly adding other organic material and deferring tillage when the soils are wet improve tilth and fertility, help to prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay is effective in controlling erosion. 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.

These soils are well suited to trees. A few small areas support native hardwoods. No major hazards or limitations affect planting or harvesting if suitable species are selected for planting and the stand is managed properly.

The land capability classification is IIIe.

429E2—Downs-Lamont complex, 14 to 18 percent slopes, moderately eroded. These moderately steep, well drained soils are on upland side slopes. Areas range from 10 to 80 acres in size and are irregularly

shaped. They are about 60 percent Downs soil and 30 percent Lamont soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Downs soil is very dark grayish brown silt loam about 7 inches thick. It is mixed with some streaks and pockets of brown material from the subsoil. The subsoil is friable silty clay loam about 40 inches thick. The upper 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, mottled silt loam.

Typically, the surface layer of the Lamont soil is dark grayish brown fine sandy loam about 8 inches thick. It is mixed with some streaks and pockets of dark yellowish brown material from the subsoil. The subsoil extends to a depth of about 60 inches. The upper part is dark yellowish brown, very friable fine sandy loam, the next part is yellowish brown, very friable fine sandy loam, and the lower part is brownish yellow, loose loamy fine sand that has lamellae of strong brown sandy loam. The lamellae are 0.5 to 1.0 inch thick. In places the subsoil is silt loam below a depth of 50 inches.

Included with these soils in mapping are small areas of Chelsea and Gara soils. Chelsea soils have a surface layer of loamy sand or sand. They have a lower available water capacity than the Downs and Lamont soils. Gara soils have a surface layer of loam. They formed in glacial till. The included soils are in landscape positions similar to those of the Downs soil. They make up about 10 percent of the unit.

Permeability is moderate in the Downs soil and moderately rapid in the Lamont soil. Runoff is rapid on both soils. Available water capacity is high in the Downs soil and moderate in the Lamont soil. The content of organic matter is about 2.0 to 3.0 percent in the surface layer of the Downs soil and 0.4 to 1.5 percent in the surface layer of the Lamont soil. The subsoil of the Downs and Lamont soils generally has a high to low supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

Most areas are used for cultivated crops. Some are used for pasture. These soils are poorly suited to corn, soybeans, and small grain. They are moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. Soil blowing on the Lamont soil can cause further erosion and may damage crops on it and on the surrounding Downs soil. Contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops help to control erosion. Returning crop residue to the soil or regularly adding other organic material and deferring tillage when the soils are wet improve tilth and fertility, help to prevent surface crusting, and increase the rate of water infiltration.

A cover of pasture plants or hay is effective in controlling erosion. 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.

These soils are moderately well suited to trees. A few small areas support native hardwoods. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Survival of seedlings generally is not a management concern.

The land capability classification is IVe.

429E3—Downs-Lamont complex, 14 to 18 percent slopes, severely eroded. These moderately steep, well drained soils are on upland side slopes. Areas range from 5 to 20 acres in size and are irregularly shaped. They are about 60 percent Downs soil and 30 percent Lamont soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Downs soil is brown silty clay loam about 6 inches thick. It contains some streaks and pockets of very dark grayish brown material from the original surface soil. The subsoil is friable silty clay loam about 35 inches thick. The upper 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, mottled silt loam.

Typically, the surface layer of the Lamont soil is dark yellowish brown fine sandy loam about 6 inches thick. It contains some streaks and pockets of dark grayish brown material from the original surface soil. The subsoil extends to a depth of about 60 inches. The upper part is dark yellowish brown, very friable fine sand, the next part is yellowish brown, very friable fine sandy loam, and the lower part is brownish yellow, loose loamy fine sand that has lamellae of strong brown sandy loam. The lamellae are 0.5 to 1.0 inch thick. In places the subsoil is silt loam below a depth of 50 inches.

Included with these soils in mapping are areas of Chelsea soils. Chelsea soils are in landscape positions similar to those of the Downs soil. They have a surface layer of loamy sand or sand. They have a lower available water capacity than the Downs and Lamont soils. They make up about 10 percent of the unit.

Permeability is moderate in the Downs soil and moderately rapid in the Lamont soil. Runoff is rapid on

both soils. Available water capacity is high in the Downs soil and moderate in the Lamont soil. The content of organic matter is about 1.0 to 2.0 percent in the surface layer of the Downs soil and 0.4 to 1.5 percent in the surface layer of the Lamont soil. The subsoil of the Downs and Lamont soils generally has a high to low supply of available phosphorus and a very low supply of available potassium. Tilth is poor.

Most areas are used for cultivated crops. Some are used for pasture. These soils generally are unsuited to cultivated crops because further erosion is a serious hazard. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture. More nitrogen generally is needed in areas of these soils than in areas of Downs and Lamont soils that are not so eroded. More intensive management also is needed to improve and maintain productivity.

A cover of pasture plants or hay is effective in controlling erosion. 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.

These soils are moderately well suited to trees. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Survival of seedlings generally is not a management concern.

The land capability classification is VIe.

429F2—Downs-Lamont complex, 18 to 25 percent slopes, moderately eroded. These steep, well drained soils are on upland side slopes. Areas range from 5 to 15 acres in size and are irregularly shaped. They are about 60 percent Downs soil and 30 percent Lamont soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Downs soil is very dark grayish brown silt loam about 7 inches thick. It is mixed with some streaks and pockets of yellowish brown material from the subsoil. The subsoil is friable silty clay loam about 40 inches thick. The upper 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, mottled silt loam.

Typically, the surface layer of the Lamont soil is dark grayish brown fine sandy loam about 8 inches thick. It includes some streaks and pockets of dark yellowish brown material from the subsoil. The subsoil extends to a depth of about 60 inches. The upper part is dark yellowish brown, very friable fine sandy loam, the next part is yellowish brown, very friable fine sandy loam, and the lower part is brownish yellow, loose loamy fine sand that has lamellae of strong brown sandy loam. The lamellae are 0.5 to 1.0 inch thick. In places the subsoil is silt loam below a depth of 50 inches.

Included with these soils in mapping are small areas of Chelsea soils. Chelsea soils are in landscape positions similar to those of the Downs soil. They have a surface layer of loamy sand or sand. They have a lower available water capacity than the Downs and Lamont soils. They make up about 10 percent of the unit.

Permeability is moderate in the Downs soil and moderately rapid in the Lamont soil. Runoff is rapid on both soils. Available water capacity is high in the Downs soil and moderate in the Lamont soil. The content of organic matter is about 2.0 to 3.0 percent in the surface layer of the Downs soil and 0.4 to 1.5 percent in the surface layer of the Lamont soil. The subsoil of the Downs and Lamont soils generally has a high to low supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

Most areas are used for cultivated crops. Some are used for pasture. Most areas of these soils are managed along with areas of adjacent soils. These soils generally are unsuited to cultivated crops because of the slope and the hazard of further erosion. They are moderately well suited to grasses and legumes for hay and pasture. Because of the slope, operating farm equipment is hazardous. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture.

A cover of pasture plants or hay is effective in controlling erosion. Overgrazing causes surface compaction and poor tilth, increases the runoff rate, and reduces forge production. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

These soils are moderately well suited to trees. A few areas support native hardwoods. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Survival of seedlings generally is not a management concern.

The land capability classification is VIe.

430—Ackmore silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on bottom land. It is subject to flooding. Areas typically 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 silt loam about 7 inches thick. The substratum is very dark grayish brown and very dark gray, mottled, stratified silt loam about 20 inches thick. Below this to a depth of about 60 inches is a buried layer of silty clay loam. The upper part of the buried layer is black, and the lower part is very dark gray and mottled.

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. They dry out more slowly after periods of rainfall than the Ackmore soil and 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 soil has a seasonal high water table. The content of organic matter in the surface layer is about 1 to 3 percent. The substratum generally has a low supply of available phosphorus and a low or very low supply of available potassium. Tilth is good.

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 helps to overcome the wetness and provide good aeration and a deep root zone for plants. Tile drains work well if they are properly installed and if adequate outlets are available. 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.

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. Areas range from 5 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The substratum is very dark grayish brown and very dark gray, mottled, stratified silt loam about 20 inches thick. Below this to a depth of about 60 inches is a buried layer of silty clay loam. The upper part of the buried layer is black, and the lower part is very dark gray and mottled.

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. They dry out more slowly after periods of rainfall than the Ackmore soil and 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 soil has a seasonal high water table. The content of organic matter in the surface layer is about 1 to 3 percent. The substratum generally has a low supply of available phosphorus and a low or very low supply of available potassium. Tilth is good.

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 helps to overcome the wetness and provide good aeration and a deep root zone for plants. Tile drains work well if they are properly installed and if adequate outlets are available. 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.

The land capability classification is IIw.

462B—Downs silt loam, benches, 2 to 5 percent slopes. This gently sloping, well drained soil is on high, loess-covered terraces along the major streams. 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 7 inches thick. The subsurface layer is dark grayish brown silt loam about 4 inches thick. The subsoil is friable silty clay loam about 36 inches thick. The upper 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, mottled silt loam.

Permeability is moderate, 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 subsoil generally has a high supply of available phosphorus and a very low supply of available potassium. Tilth is good.

Most areas are used for cultivated crops. A few are in pasture. 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 contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. In places contour farming and terracing are difficult because the slopes are short and complex and because of the position of the soil on the landscape. 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 is effective in controlling erosion. 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 IIe.

462C—Downs silt loam, benches, 5 to 9 percent slopes. This moderately sloping, well drained soil is on high, loess-covered terraces along the major streams. 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 7 inches thick. The subsurface layer is dark grayish brown silt loam about 4 inches thick. The subsoil is friable silty clay loam about 36 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, mottled silt loam. In places the surface layer is very dark grayish brown and has some streaks and pockets of brown silty clay loam from the subsoil.

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

Most areas are used for cultivated crops. A few are in pasture. This soil is moderately well suited to corn, soybeans, and small grain. It 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 contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. In places contour farming and terracing are difficult because the slopes are short and complex and because of the position of the soil on the landscape. 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 is effective in controlling erosion. 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 IIIe.

478G—Emeline-Rock outcrop complex, 25 to 60 percent slopes. This map unit occurs as areas of a very steep, somewhat excessively drained Emeline soil intermingled with areas of outcroppings of limestone bedrock. It is on escarpments and upland slopes along the major streams. The escarpments are commonly 100 to 150 feet high. The slopes commonly are wooded and covered by huge masses of blocks of limestone that have broken off from the higher, adjacent slopes. Areas range from 5 to 40 acres in size. They are long and narrow. They are about 50 percent Emeline soil and 40 percent Rock outcrop. The soil and the Rock outcrop occur as areas so intermingled or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Emeline soil is black silt loam about 8 inches thick. Fractured, thin-bedded limestone bedrock is at a depth of about 8 inches.

Typically, the Rock outcrop is limestone bedrock. A thin layer of silt loam covers the bedrock in places.

Included in this unit in mapping are small areas of Fayette and Lindley soils on the upper part of slopes. Fayette soils have a subsoil of silty clay loam. Lindley soils have a subsoil of clay loam. Included soils make up about 5 to 10 percent of the unit.

Permeability of this Emeline soil is moderate, and runoff is rapid. Available water capacity is very low. The content of organic matter in the surface layer is about 2 to 3 percent. The soil generally has a very low supply of available phosphorus and a low supply of available potassium. Tilth generally is poor because many flagstones are on the surface.

Most areas are wooded. A few are in permanent pasture. This map unit is unsuited to cultivated crops, hay, and pasture because of the slope and the Rock outcrop.

This map unit is poorly suited to trees. Seedling mortality is severe because of the slope and the depth to limestone bedrock. The limestone is fractured, however, and tree roots can penetrate the rock crevasses. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment. Harvest methods that leave individual trees widely spaced reduce the windthrow hazard. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion and overcome the slope. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also inhibits tree regeneration and causes root damage, which leads to heartrot and other diseases.

The land capability classification of the Emeline soil is VIIs.

484—Lawson silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on flood plains along the major streams and their tributaries. It is subject to flooding. Areas range from 15 to 80 acres in size. They are narrow or wide and elongated.

Typically, the surface layer is very dark gray silt loam about 7 inches thick. The subsurface layer is silt loam about 28 inches thick. The upper part is very dark gray, and the lower part is very dark grayish brown. The substratum to a depth of about 60 inches is dark grayish brown, mottled silt loam.

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

Permeability of this Lawson soil is moderate, and runoff is very slow or ponded. Available water capacity is high. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 4.4 to 6.0 percent. The substratum generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is good.

Most areas are used for cultivated crops. Some are in permanent pasture. If protected from flooding, this soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. It is wet as a result of the flooding, the very slow runoff or ponding, and the seasonal high water table. The flooding damages crops in some years. Drainage tile can function adequately if outlets are available. In some of the smaller areas, diversion terraces help to control floodwater. In the larger areas, however, dikes or levees are needed to control floodwater.

The wetter areas are used mainly as pasture. Overgrazing or grazing during wet periods causes excessive 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 IIw.

485—Spillville loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on flood plains along major rivers and streams. It is subject to flooding. Areas range from 5 to 100 acres in size. They are long and narrow or irregularly shaped.

Typically, the surface layer is black loam about 7 inches thick. The subsurface layer is loam about 38 inches thick. The upper part is very dark brown, the next part is very dark grayish brown, and the lower part is very dark grayish brown and mottled. The substratum to a depth of about 60 inches is dark grayish brown, mottled loam. In places the substratum is sandy loam or loamy sand.

Permeability is moderate, and runoff is slow. Available water capacity is high. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 4 to 5 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is good.

Most areas are used for cultivated crops. Some are in permanent pasture. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Wetness is a limitation because of the flooding and the seasonal high water table. Measures that help to overcome the wetness improve the timeliness of fieldwork. 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.

If this soil is used for pasture, overgrazing or grazing during wet periods causes surface compaction, reduces the rate of water infiltration, and reduces forage production. 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 IIw.

673D2—Timula silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is in coves at the head of upland drainageways. Areas range from 5 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. It is mixed with some streaks and pockets of yellowish brown material from the subsoil. The subsoil is friable silt loam about 16 inches thick. The upper part is yellowish brown, and the lower part is yellowish brown and grayish brown. The substratum to a depth of about 60 inches is light brownish gray, mottled silt loam. It is calcareous in the lower part.

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

Most areas are used for cultivated crops. A few are used for pasture. This soil is moderately well suited to corn, soybeans, and small grain. It 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 by contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 controlling erosion. 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 fairly good condition.

This soil is well suited to trees. No major hazards or limitations affect planting or harvesting if suitable species are selected for planting and the stand is managed properly.

The land capability classification is IIIe.

673D3—Timula silt loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, well drained soil is in coves at the head of upland drainageways. Areas range from 5 to 15 acres in size and are irregularly shaped.

Typically, the surface layer is yellowish brown silt loam about 6 inches thick. It contains some streaks and pockets of dark grayish brown material from the original surface soil. The subsoil is friable silt loam about 16 inches thick. The upper part is yellowish brown, and the lower part is yellowish brown and grayish brown. The substratum to a depth of about 60 inches is light brownish gray, mottled silt loam. It is calcareous in the lower part.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 0.4 to 2.0 percent. The subsoil generally has a low supply of available phosphorus and a very low supply of potassium. Tilth is poor.

Most areas are cultivated. This soil generally is poorly suited to corn, soybeans, and small grain. It is moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a serious hazard. It can be controlled by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. Constructing terraces is difficult in a few areas because of the short, irregularly shaped slopes. 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. More nitrogen generally is needed in areas of this soil than in areas of Timula soils that are not so eroded. More intensive management also is needed to maintain productivity and improve tilth.

A cover of pasture plants or hay is effective in controlling erosion. Overgrazing causes surface compaction, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in fairly good condition.

This soil is well suited to trees. No major hazards or limitations affect planting or harvesting if suitable species are selected for planting and the stand is managed properly.

The land capability classification is IVe.

673E2—Timula silt loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is in coves along upland drainageways and on short, convex side slopes. Areas range from 5 to 40 acres in size and are elongated.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. It is mixed with some streaks and pockets of yellowish brown material from the subsoil. The subsoil is friable silt loam about 16 inches thick. The upper part is yellowish brown, and the lower part is yellowish brown and grayish brown. The substratum to a depth of about 60 inches is light brownish gray, mottled silt loam. It is calcareous in the lower part.

Included with this soil in mapping are small areas of Lindley soils. These soils are in landscape positions similar to those of the Timula soil. They formed in glacial till and have more sand throughout the profile than the Timula soil. They make up about 5 percent of the unit.

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

Most areas are used for cultivated crops. Some are pastured or wooded. This soil is poorly suited to corn, soybeans, and small grain. It is moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. It can be controlled by contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. The soil generally is not suited to terraces because the slopes are too steep and are short and complex. 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 controlling erosion. Overgrazing causes surface compaction and poor tilth, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in fairly good condition.

This soil is moderately well suited to trees. Seedlings survive and grow well. The hazard of erosion and the

equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when this equipment are operated.

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. Areas range from 5 to 20 acres in size and are elongated.

Typically, the surface layer is yellowish brown silt loam about 6 inches thick. It contains some streaks and pockets of dark grayish brown material from the original surface soil. The subsoil is friable silt loam about 16 inches thick. The upper part is yellowish brown, and the lower part is yellowish brown and grayish brown. The substratum to a depth of about 60 inches is light brownish gray, mottled silt loam. It is calcareous in the lower part.

Included with this soil in mapping are small areas of Lindley soils. These soils formed in glacial till. They have more sand throughout the profile than the Timula soil. They make up about 5 percent of the unit.

Permeability of this Timula soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 0.4 to 2.0 percent. The subsoil generally has a low supply of available phosphorus and a very low supply of potassium. Tilth is poor.

Many areas are used for cultivated crops. Some are in permanent pasture. This soil generally is unsuited to cultivated crops because further erosion is a serious hazard. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture. More nitrogen generally is needed in areas of this soil than in areas of Timula soils that are not so eroded. More intensive management also is needed to improve and maintain productivity.

A cover of pasture plants or hay is effective in controlling erosion. Overgrazing causes surface compaction, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in fairly good condition.

This soil is moderately suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment.

The land capability classification is VIe.

673F2—Timula silt loam, 18 to 25 percent slopes, moderately eroded. This steep, well drained soil is in coves along upland drainageways and on short, convex side slopes. The side slopes are dissected by many small waterways. Areas range from 5 to 25 acres in size and are elongated.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. It is mixed with some streaks and pockets of yellowish brown material from the subsoil. The subsoil is friable silt loam about 16 inches thick. The upper part is yellowish brown, and the lower part is yellowish brown and grayish brown. The substratum to a depth of about 60 inches is light brownish gray, mottled silt loam. It is calcareous in the lower part.

Included with this soil in mapping are small areas of Lindley soils. These soils are in landscape positions similar to those of the Timula soil. They formed in glacial till and have more sand throughout the profile than the Timula soil. They make up about 5 percent of the unit.

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

Some areas are used for cultivated crops. Most are used for pasture. This soil generally is unsuited to cultivated crops because of the slope and the hazard of further erosion. It is moderately well suited to grasses and legumes for hay and pasture. Operating farm machinery is hazardous because of the slope and the waterways. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture.

A cover of pasture plants is effective in controlling erosion. Overgrazing causes surface compaction and poor tilth, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in fairly good condition.

This soil is moderately well suited to trees. Seedlings survive and grow well. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging

equipment is needed. Caution is needed when this equipment is operated.

The land capability classification is VIe.

673F3—Timula 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 side slopes are dissected by many small waterways. Areas range from 5 to 20 acres in size and are elongated.

Typically, the surface layer is yellowish brown silt loam about 6 inches thick. It contains some streaks and pockets of dark grayish brown material from the original surface soil. The subsoil is friable silt loam about 16 inches thick. The upper part is yellowish brown, and the lower part is yellowish brown and grayish brown. The substratum to a depth of about 60 inches is light brownish gray, mottled silt loam. It is calcareous in the lower part.

Included with this soil in mapping are small areas of Lindley soils. These soils are in landscape positions similar to those of the Timula soil. They have more sand throughout the profile than the Timula soil. They make up about 5 percent of the unit.

Permeability of this Timula soil is moderate, and runoff is very rapid. Available water capacity is high. The content of organic matter in the surface layer is about 0.4 to 2.0 percent. The subsoil generally has a low supply of available phosphorus and a very low supply of potassium. Tilth is poor.

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

A cover of pasture plants is effective in controlling erosion. Overgrazing causes surface compaction, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in fairly good condition.

This soil is moderately well suited to trees. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment.

The land capability classification is VIe.

673G—Timula silt loam, 25 to 40 percent slopes. This very steep, well drained soil is in coves at the head of drainageways and on short, convex side slopes. The side slopes are dissected by many small waterways. Areas range from 5 to 25 acres in size and are elongated.

Typically, the surface layer is very dark gray silt loam about 4 inches thick. The subsurface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is friable silt loam about 16 inches thick. The upper part is yellowish brown, and the lower part is yellowish brown and grayish brown. The substratum to a depth of about 60 inches is light brownish gray, mottled silt loam. It is calcareous in the lower part. In places the surface layer is yellowish brown.

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

Some areas are used for cultivated crops. Most are used for pasture. This soil generally is unsuited to cultivated crops because of the slope and the hazard of further erosion. It is only moderately well suited to grasses and legumes for hay and pasture. Operating farm machinery is a hazard because of the slope and the waterways. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture.

A cover of pasture plants is effective in controlling erosion. Overgrazing causes surface compaction and poor tilth, increases the runoff rate, and reduces forage production. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in fairly good condition.

This soil is moderately well suited to trees. Seedlings survive and grow well. The hazard of erosion and the equipment limitation are moderate. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour or nearly on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when operating this equipment.

The land capability classification is VIIe.

683C2—Liscomb 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 5 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown loam about 7 inches thick. It is mixed with some streaks and

pockets of dark brown material from the subsurface layer. The subsurface layer is dark brown and brown loam about 5 inches thick. The subsoil is friable loam about 33 inches thick. The upper part is 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, mottled loam.

Included with this soil in mapping are small areas of Dinsdale soils. These soils have 20 to 40 inches of loess overlying glacial till. They generally are higher on the landscape than the Liscomb soil. They make up about 5 to 10 percent of the unit.

Permeability of this Liscomb soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 2.2 to 3.2 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is good.

Most areas are used for cultivated crops. A few are used for pasture. This soil is moderately well suited to corn, soybeans, and small grain. It 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 by contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. The slopes commonly are short and irregular. Terracing is difficult, but in some areas this soil can be terraced along with other soils upslope. 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 is effective in controlling erosion. 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 IIIe.

683D2—Liscomb loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is on short, convex nose slopes and side slopes in the uplands. Areas range from 5 to 40 acres in size and are elongated.

Typically, the surface layer is very dark brown, friable loam about 7 inches thick. It is mixed with some streaks and pockets of dark brown material from the subsoil. The subsoil is friable loam about 38 inches thick. The upper part is 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, mottled loam. In places the surface layer is dark brown and dark yellowish brown.

Included with this soil in mapping are small areas of sandy soils. These soils are in landscape positions similar to those of the Liscomb soil. They have a lower content of organic matter and are lower in natural fertility than the Liscomb soil. They make up about 5 to 10 percent of the unit.

Permeability of this Liscomb soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 2.2 to 3.2 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is good.

Most areas are used for cultivated crops. Some are used for pasture. This soil is moderately well suited to corn, soybeans, and small grain. It 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 by contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. Slopes commonly are short and irregular. Terracing is difficult, but some areas on the higher part of the slope can be terraced. 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 is effective in controlling erosion. 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 IIIe.

683D3—Liscomb loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, well drained soil is on short, convex nose slopes and side slopes in the uplands. Areas range from 5 to 20 acres in size and are elongated.

Typically, the surface layer is brown and dark yellowish brown loam about 6 inches thick. It contains some streaks and pockets of very dark brown material from the original surface soil. The subsoil is friable loam about 39 inches thick. The upper part is 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, mottled loam.

Included with this soil in mapping are small areas of sandy soils. These soils are in landscape positions similar to those of the Liscomb soil. They have a lower content of organic matter and a lower water-holding

capacity than the Liscomb soil. They make up about 5 percent of the unit.

Permeability of this Liscomb soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 1.2 to 2.2 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is poor.

Most areas are used for cultivated crops. Some are used for pasture. This soil is poorly suited to corn, soybeans, and small grain. It is moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a serious hazard. It can be controlled by contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 is needed in areas of this soil than in areas of Liscomb soils that are not so eroded. More intensive management also is needed to maintain productivity.

A cover of pasture plants or hay is effective in controlling erosion. Overgrazing causes surface compaction, 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 IVe.

683E2—Liscomb 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 40 acres in size and are elongated.

Typically, the surface layer is very dark brown loam about 7 inches thick. It is mixed with some streaks and pockets of dark brown material from the subsoil. The subsoil is friable loam about 38 inches thick. The upper part is 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, mottled loam. In places the surface layer is dark yellowish brown and brown.

Included with this soil in mapping are small areas of sandy soils. These soils are in landscape positions similar to those of the Liscomb soil. They have a lower content of organic matter and a lower water-holding capacity than the Liscomb soil. They make up about 5 percent of the unit.

Permeability of this Liscomb soil is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 2.2 to 3.2 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is good.

Most areas are used for cultivated crops. Some are used for hay or pasture. This soil is suited to corn, soybeans, and small grain. It is moderately well suited to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a hazard. It can be controlled by contour farming, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. 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 controlling erosion. 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 IVe.

683E3—Liscomb loam, 14 to 18 percent slopes, severely eroded. This moderately steep, well drained soil is on short, convex nose slopes and side slopes in the uplands. Areas range from 5 to 20 acres in size and are elongated.

Typically, the surface layer is brown and dark yellowish brown loam about 6 inches thick. It contains some streaks and pockets of very dark brown material from the original surface soil. The subsoil is friable loam about 30 inches thick. The upper part is 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, mottled loam.

Permeability is moderate, and runoff is rapid. Available water capacity is high. The content of organic matter in the surface layer is about 1.2 to 2.2 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is poor.

Many areas are used for cultivated crops. A few are used for pasture. This soil generally is unsuited to cultivated crops because of the slope and because further erosion is a serious hazard. Cultivated crops should be grown only to help reestablish grasses and legumes for hay and pasture. More fertilizer generally is needed in areas of this soil than in areas of Liscomb soils that are not so eroded. More intensive management also is needed to improve productivity.

A cover of pasture plants or hay is effective in controlling erosion. Overgrazing causes surface compaction, 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 VIe.

771B—Waubeek silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on upland ridges and side slopes. 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 7 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is about 40 inches thick. The upper part is brown, friable silty clay loam, the next part is yellowish brown, friable silty clay loam, and the lower part is strong brown, firm loam. The substratum to a depth of about 60 inches is yellowish brown loam. A line of stones and a 1- to 2-inch-thick layer of sandy material separate the loess and the underlying firm glacial till.

Included with this soil in mapping are small areas of soils that formed in glacial till. These soils are on the lower side slopes and nose slopes. They have a surface layer of loam and have many stones on the surface. They make up about 5 percent of the unit.

Permeability of this Waubeek soil is moderate, and runoff is medium or slow. Available water capacity is high. The content of organic matter in the surface layer is about 2.5 to 3.5 percent. The subsoil generally has a medium supply of available phosphorus and a very low supply of available potassium. Tilth is good.

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 contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. The less productive underlying glacial till should be exposed as little as possible when terraces are constructed. 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 is effective in controlling erosion. 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 IIe.

771C—Waubeek silt loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on upland ridges and side slopes. Areas range from 5 to 40 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is about 40 inches thick. The upper part is brown, friable silty clay loam, the next part is yellowish brown, friable silty clay loam, and the lower part is strong brown, firm loam. The substratum to a depth of about 60 inches is yellowish brown loam. A line of stones and a 1- to 2-inch-thick layer of sandy material separate the loess and the underlying firm glacial till.

Included with this soil in mapping are small areas of soils that formed in glacial till. These soils are on the lower side slopes and nose slopes. They have a surface layer of loam and have many stones on the surface. They make up about 5 percent of the unit.

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

Most areas are cultivated. This soil is moderately well suited to corn, soybeans, and small grain. It 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 contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. The less productive underlying glacial till should be exposed as little as possible when terraces are constructed. 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 is effective in controlling erosion. 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 IIIe.

771C2—Waubeek silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is on upland ridges and side slopes. Areas range from 5 to 80 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. It is mixed with some streaks and pockets of brown material from the subsoil. The subsoil is about 40 inches thick. The upper

part is brown, friable silty clay loam, the next part is yellowish brown, friable silty clay loam, and the lower part is strong brown, firm loam. The substratum to a depth of about 60 inches is yellowish brown loam. A line of stones and a 1- to 2-inch-thick layer of sandy material separate the loess and the underlying firm glacial till.

Included with this soil in mapping are small areas of soils that formed in glacial till. These soils are on nose slopes and the lower side slopes. They have a surface layer of loam and have many stones on the surface. They make up about 5 to 10 percent of the unit.

Permeability of this Waubeek 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 medium supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

Most areas are cultivated. This soil is moderately well suited to corn, soybeans, and small grain. It 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 by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. The less productive underlying glacial till should be exposed as little as possible when terraces are constructed. 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 is effective in controlling erosion. 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 IIIe.

771D2—Waubeek silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is on upland side slopes. Areas range from 5 to 20 acres in size and are irregularly shaped.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. It is mixed with some streaks and pockets of brown material from the subsoil. The subsoil is about 40 inches thick. The upper part is brown, friable silty clay loam, the next part is yellowish brown, friable silty clay loam, and the lower part is strong brown, firm loam. The substratum to a depth of about 60 inches is yellowish brown loam. A line of stones and a 1- to 2-inch-thick layer of sandy material separate the loess and the underlying firm glacial till.

Included with this soil in mapping are small areas of soils that formed in glacial till. These soils are on the lower side slopes and nose slopes. They have a surface layer of loam and have many stones on the surface. They make up about 5 to 10 percent of the unit.

Permeability of this Waubeek 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 medium supply of available phosphorus and a very low supply of available potassium. Tilth is fair.

Most areas are cultivated. This soil is moderately well suited to corn, soybeans, and small grain. It 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 by contour farming, terraces, a system of conservation tillage that leaves crop residue on the surface, and crop rotations that include meadow crops. The less productive underlying glacial till should be exposed as little as possible when terraces are constructed. 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 is effective in controlling erosion. 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 IIIe.

926—Canoe silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on alluvial terraces along the major streams and rivers. Areas range from 5 to 60 acres in size and are irregularly shaped.

Typically, the surface layer is very dark brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 12 inches thick. The subsoil is grayish brown, mottled, friable silt loam about 24 inches thick. The substratum to a depth of about 60 inches is grayish brown and yellowish brown silt loam.

Included with this soil in mapping are small areas of the very poorly drained Humeston soils. These soils are in depressions. They make up about 5 percent of the unit.

Permeability of this Canoe soil is moderate, and runoff is slow. Available water capacity is very high. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 2.5 to 3.5 percent. The subsoil generally has a medium supply of

available phosphorus and a very low supply of available potassium. Tilth is good.

Most areas are used for cultivated crops. A few are in permanent pasture. 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 siltation and to control runoff. Drainage tile can function adequately if outlets are available. 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 is effective in controlling erosion. Overgrazing causes surface compaction and poor tilth and reduces forage production. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Seedling mortality and the hazard or limitations that affect planting or harvesting are slight.

The land capability classification is I.

933B—Sawmill silty clay loam, 1 to 4 percent slopes. This gently sloping, poorly drained soil is in narrow upland waterways. It is subject to flooding. Areas range from 5 to 40 acres in size. They are elongated or irregularly shaped.

Typically, the surface layer is black silty clay loam about 7 inches thick. The subsurface layer is friable silty clay loam about 27 inches thick. The upper part is black, and the lower part is very dark gray and mottled. The subsoil is dark gray, mottled, friable silty clay loam about 13 inches thick. The substratum to a depth of about 60 inches is olive gray and yellowish brown silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Ely soils. These soils are on the foot slopes of adjacent side slopes. They make up about 5 to 10 percent of the unit.

Permeability of this Sawmill soil is moderate, and runoff is slow. Available water capacity is high. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 5 to 7 percent. The subsoil generally has a medium supply of available phosphorus and a low supply of available potassium. Tilth is fair.

Most areas are used for cultivated crops. Inadequately drained areas generally are used for pasture. If drained and protected from runoff from the higher slopes, 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. 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 used for pasture, overgrazing or grazing when the soil is too wet causes puddling and poor tilth 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.

The land capability classification is IIw.

978—Festina silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on alluvial terraces along the major streams and the Iowa River. Areas range from 5 to 60 acres in size and are irregularly shaped.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 6 inches thick. The subsoil is yellowish brown, friable silt loam about 32 inches thick. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the lower part of the subsoil is sand or sand and gravel.

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

Most areas are used for cultivated crops. A few are in permanent pasture. 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, the hazard of erosion is slight. A system of conservation tillage that leaves crop residue on the surface helps to control erosion. The soil is subject to siltation from soils on higher slopes. Diversion terraces are needed in some areas to help control runoff. 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 controlling erosion. 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.

This soil is well suited to trees. Seedling mortality and the hazards or limitations that affect planting or harvesting are slight.

The land capability classification is I.

993E2—Gara-Armstrong complex, 14 to 18 percent slopes, moderately eroded. These moderately steep soils are on upland side slopes and interfluves. The well drained Gara soil is on the lower part of the side slopes, and the moderately well drained Armstrong soil is on the upper part. Areas range from 5 to 30 acres in size and are irregularly shaped. They are about 70 percent Gara soil and 30 percent Armstrong soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Gara soil is very dark grayish brown loam about 7 inches thick. It is mixed with some streaks and pockets of strong brown material from the subsoil. The subsoil is firm clay loam about 43 inches thick. The upper part is strong brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Typically, the surface layer of the Armstrong soil is very dark grayish brown silt loam about 7 inches thick. It includes some streaks and pockets of yellowish brown material from the subsoil. The subsoil is about 36 inches thick. The upper part is yellowish brown, friable silt loam, the next part is brown, mottled, firm clay loam, and the lower part is strong 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 mixed yellowish brown and dark reddish brown.

Permeability is moderately slow in the Gara soil and slow in the Armstrong soil. Runoff is rapid on both soils. Available water capacity is high. The Armstrong soil has a seasonal high water table. The content of organic matter is about 2 to 3 percent in the surface layer of both soils. The shrink-swell potential is high in the Armstrong soil. The subsoil of the Gara soil generally has a low supply of available phosphorus and a very low supply of available potassium. The subsoil of the Armstrong soil generally has a very low supply of available phosphorus and potassium. Tilth is fair in both soils.

Most areas are used for cultivated crops. Some are used for hay or pasture. These soils generally are unsuited to cultivated crops because of the slope and a hazard of further erosion. They are moderately well suited to grasses and legumes for hay and pasture.

A cover of pasture plants or hay is effective in controlling erosion. 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, especially during wet periods, help to keep the pasture in good condition.

These soils are moderately well suited to trees. The hazard of erosion, the equipment limitation, and seedling mortality are the main management concerns. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when this equipment is operated. Seedlings should be planted at close intervals because they do not survive and grow well. Thinning the stands helps to provide adequate growing space for the surviving trees. Windthrow is a hazard on the Armstrong soil because the root zone is shallow. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIe.

993E3—Gara-Armstrong complex, 14 to 18 percent slopes, severely eroded. These moderately steep soils are on upland side slopes and interfluves. The well drained Gara soil is on the lower part of the side slopes, and the moderately well drained Armstrong soil is on the upper part. Areas range from 5 to 20 acres in size and are irregularly shaped. They are about 70 percent Gara soil and 30 percent Armstrong soil. These soils occur as areas so intricately mixed or so small in size that mapping them separately is impractical.

Typically, the surface layer of the Gara soil is yellowish brown clay loam about 6 inches thick. It has some streaks and pockets of very dark grayish brown material from the original surface soil. The subsoil is firm clay loam about 43 inches thick. The upper part is strong brown, and the lower part is yellowish brown and mottled. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Typically, the surface layer of the Armstrong soil is yellowish brown silt loam about 7 inches thick. It contains some streaks and pockets of very dark grayish brown material from the original surface soil. The subsoil is about 36 inches thick. The upper part is yellowish brown, friable silt loam, the next part is brown, mottled, firm clay loam, and the lower part is strong 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 mixed yellowish brown and dark reddish brown.

Permeability is moderately slow in the Gara soil and slow in the Armstrong soil. Runoff is rapid on both soils. Available water capacity is high. The Armstrong soil has a seasonal high water table. The content of organic matter is about 0.4 to 2.5 percent in the surface layer of both soils. The shrink-swell potential is high in the Armstrong soil. The subsoil of the Gara soil generally has a low supply of available phosphorus and a very low supply of available potassium. The subsoil of the

Armstrong soil generally has a very low supply of available phosphorus and potassium. Tilth is poor in both soils.

Most areas are used for cultivated crops. Some are used for hay or pasture. These soils generally are unsuited to cultivated crops because of the slope and a serious hazard of further erosion. They are moderately well suited to grasses and legumes for hay and pasture.

A cover of pasture plants or hay is effective in controlling erosion. 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, especially during wet periods, help to keep the pasture in good condition.

These soils are moderately well suited to trees. The hazard of erosion, the equipment limitation, and seedling mortality are the main management concerns. Carefully selecting sites for logging trails and roads and laying out the trails and roads on the contour help to control erosion. Because of the slope, special logging equipment is needed. Caution is needed when this equipment is operated. Seedlings should be planted at close intervals because they do not survive and grow well. Thinning the stands helps to provide adequate growing space for the surviving trees. Windthrow is a hazard on the Armstrong soil because the root zone is shallow. Woodlots that are used for grazing are subject to compaction and erosion. Grazing also causes root damage, which leads to heartrot and other diseases.

The land capability classification is VIe.

1133—Colo silty clay loam, channeled, 0 to 2 percent slopes. This nearly level, poorly drained soil is on flood plains along the larger streams and their tributaries. It is frequently flooded. It generally is dissected by many stream channels. As a result, escarpments are common on the higher alluvial terraces. Oxbows and marshy areas are below most of the escarpments. Areas of this unit are several hundred acres in size and are wide and elongated.

Typically, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer is black silty clay loam about 24 inches thick. The subsoil is friable silty clay loam about 18 inches thick. The upper part is very dark gray, and the lower part is dark gray. The substratum to a depth of about 60 inches is dark gray, mottled silt loam. In places the surface layer is overlain by about 10 inches of recently deposited silt loam.

Included with this soil in mapping are areas of recently deposited silty material along the stream channels. These areas include silt bars and silty beaches. The soils in these areas have a lower content of organic matter and are flooded more often than the Colo soil. They make up about 5 to 10 percent of the unit.

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

This soil generally is not suited to cultivated crops unless it is protected by levees. A tile drainage system is needed to lower the water table. Land leveling and a surface drainage system also are needed in some areas before the oxbows and sloughs can be crossed by farm equipment.

Some areas have been cleared of native vegetation and are in permanent pasture. Other areas support bushes and scrubby trees. This soil is well suited to woodland and wetland wildlife habitat. It is best suited to pasture and wildlife habitat unless major reclamation measures are applied.

The land capability classification is Vw.

1220—Nodaway silt loam, channeled, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on flood plains along the larger streams and their tributaries. It is frequently flooded. It generally is dissected by many stream channels. As a result, escarpments are common on the high alluvial terraces. Oxbows and marshy areas are below the escarpments. Areas of this map unit are several hundred acres in size and are wide and elongated.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The substratum is dark grayish brown, grayish brown, and very dark grayish brown, stratified silt loam about 47 inches thick. Below the substratum to a depth of about 60 inches is an older, buried surface layer of black silt loam. In places the buried surface layer is below a depth of 60 inches.

Included with this soil in mapping are small areas of the poorly drained Ackmore and Colo soils. These soils are in landscape positions similar to those of the Nodaway soil. They have a higher content of organic matter in the surface layer than the Nodaway soil. Colo soils have a surface layer of silty clay loam. Included soils make up about 10 percent of the unit.

Permeability of this Nodaway soil is moderate, and runoff is slow. Available water capacity is very high. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 1.5 to 2.5 percent. The substratum generally has a medium supply

of available phosphorus and a very low supply of available potassium. Tilth is fair.

This soil generally is not suited to cultivated crops unless it is protected by levees. A tile drainage system is needed to lower the water table. Land leveling and a surface drainage system also are needed in some areas before the oxbows and sloughs can be crossed by farm equipment.

Some areas have been cleared of native vegetation and are in permanent pasture. Other areas support bushes and scrubby trees. This soil is well suited to woodland and wetland wildlife habitat. It is best suited to pasture and wildlife habitat unless major reclamation measures are applied.

The land capability classification is Vw.

1485—Spillville loam, channeled, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on flood plains along the larger streams and their tributaries. It is frequently flooded. It generally is dissected by many stream channels. As a result, escarpments are common on the high alluvial terraces. Oxbows and marshy areas are below the escarpments. Areas of this map unit range from 50 to 200 acres in size and are wide and elongated.

Typically, the surface layer is black loam about 7 inches thick. The subsurface layer is loam about 38 inches thick. The upper part is very dark brown, the next part is very dark grayish brown, and the lower part is very dark grayish brown and mottled. The substratum to a depth of about 60 inches is dark grayish brown, mottled loam. In places the substratum is sandy loam or loamy sand.

Included with this soil in mapping are areas of recently deposited sand and gravel along stream channels. These areas include sandy and gravelly beaches. The soils in these areas have a lower content of organic matter and are more frequently flooded than the Spillville soil. They make up about 5 to 10 percent of the unit.

Permeability of this Spillville soil is moderate, and runoff is slow. Available water capacity is high. The soil has a seasonal high water table. The content of organic matter in the surface layer is about 4 to 5 percent. The subsoil generally has a very low supply of available phosphorus and potassium. Tilth is good.

This soil generally is not suited to cultivated crops unless it is protected by levees. A tile drainage system is needed to lower the water table. Land leveling and a surface drainage system also are needed in some areas before the oxbows and sloughs can be crossed by farm equipment.

Some areas have been cleared of native vegetation and are in permanent pasture. Other areas support bushes and scrubby trees. This soil is well suited to woodland and wetland wildlife habitat. It is best suited to pasture, woodland, and wildlife habitat unless major reclamation measures are applied.

The land capability classification is Vw.

5010—Pits, sand and gravel. This map unit dominantly is on stream benches or on bottom land, but in some areas it is in the uplands. It is occasionally flooded for brief periods. Many of the pits are no longer mined. A few of the larger pits along the Iowa River are being mined. The pits range from about 1 to more than 60 acres in size. They are commonly square, rectangular, or triangular.

Typically, available water capacity is medium or high. The soil material generally is mixed. As a result, soil structure is destroyed. The soil material becomes cloddy and hard after a cycle of wetting and drying. In most areas it has a seasonal high water table. It is ponded in the low areas during wet periods. In a few areas stones and gravel are common on the surface. The content of organic matter in the surface layer varies from about 1 to 9 percent.

Most of the inactive pits support weeds and small trees. Some have been used as refuse dumps. The pits can be developed for wildlife habitat or recreational uses. Trees and shrubs that can withstand the effects of the high water table should be selected for planting.

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 or 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 more than 60 acres in size and commonly are square or irregular in shape. Some of the pits contain water, which can be a few feet deep to many feet deep, and have steep ridges.

The spoil surrounding the pits varies in texture but generally is silty or loamy and contains varying amounts of limestone fragments. It is derived from loess, glacial till, or a mixture of loess and glacial till. In some areas it is very uneven. In other areas, it is level and grasses and 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, however, 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 well drained to 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 5 to 10 acres in size.

Typically, the upper 60 inches of these soils is yellowish brown, friable silt loam. In some places cobbles and pebbles are common on the surface. In other places the soil material is clay loam. In some areas the surface layer is very dark gray or dark brown.

Included with these soils in mapping are small areas of sand. Inclusions make up about 10 percent of the unit.

Permeability varies in the Orthents, depending on the texture and density of the soil material. Runoff is slow to rapid. Available water capacity is high to 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. The content of organic matter is very low unless the topsoil has been redistributed throughout the area. As a result, preparing a good seedbed is difficult and 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, loamy, nearly level. These soils are used as sanitary landfills for the disposal of common waste material. In most areas the original soil has been removed to a depth of 20 feet or more. In some areas it has been replaced with layers of waste material interlayered with the soils. In other areas 4 to 12 inches of topsoil has been redistributed on the surface, commonly in an uneven pattern. The soils range from well drained to poorly drained, depending on the kind of material from which the soils were derived and the extent to which the borrow area is restored. Typically, areas range from 10 to 40 acres in size and are rectangular.

Typically, the upper 60 inches of these soils is yellowish brown silt loam. In some places cobbles and pebbles are common on the surface. In other places the soil material is loam or clay loam. In some areas the surface layer is very dark gray or dark brown.

Included with these soils in mapping are small areas of sand. The soils in these areas are excessively drained and have a lower content of organic matter than the Orthents. They make up about 10 percent of the unit.

Permeability varies in the Orthents, depending on the texture and bulk density of the soil material. Runoff is medium or rapid. Available water capacity is high to low. The soil material that was once buried 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. The content of organic matter is very low unless the topsoil has been redistributed throughout the area. In most areas these soils have a very low or low supply of available phosphorus and potassium.

Most of these soils are in areas that are being used as sanitary landfills. Areas that have been refilled and covered with some topsoil are better suited to small grain and to permanent grasses and legumes for hay and pasture than to row crops. 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 soils 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.

Prime Farmland

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

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those

crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

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

About 231,000 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 northern part, mainly in associations 1, 2, 3, and 6, which are described under the heading "General Soil Map Units." Some large, localized areas of prime farmland are in association 7. About 210,000 acres of this prime farmland is used for crops. The crops grown on this land, mainly corn and soybeans, account for an estimated three-fifths of the county's total agricultural income each year.

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.

Use and Management of the Soils

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

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

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

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

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

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

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the 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.

In 1988, about 285,000 acres in Tama County, or 61 percent of the total acreage, was used as cropland. Currently, the main crops in the county are corn and soybeans. Alfalfa or alfalfa-grass is the major hay crop. The acreage used for row crops has increased in recent years, whereas the extent of other land uses has remained about the same. Productivity could be increased and soil conservation enhanced by application of crop production technology to all of the cropland in the county. This soil survey, which gives the basic characteristics of each kind of soil, can greatly aid in the application of this technology.

The main management needs on the cropland and pasture in the county are measures that help to control erosion and soil blowing, overcome the wetness, and maintain or improve fertility and tilth.

Water erosion is the major problem on about three-fourths of the cropland and pasture in the county. It is a hazard in areas that have a slope of more than 2 percent. Loss of the surface layer through erosion reduces the productivity of soils and results in sedimentation in streams. Productivity is reduced as the surface layer is eroded and part of the subsoil is incorporated into a plow layer. Loss of the surface layer is especially damaging on soils having a subsoil that is low in fertility, such as the Lindley, Liscomb, and Shelby soils, and on soils having a clayey subsoil, such as the Clarinda and Keswick soils. Preparing a good seedbed and tilling are difficult on eroded soils because the original friable surface layer has been removed or has become thinner and the more strongly structured

subsoil commonly is hard and cloddy after periods of rainfall or if the soil is tilled when it is wet. Runoff from eroding soils commonly deposits sediment in streams, drainageways, and roadside ditches. Erosion-control measures not only help to maintain the productivity of soils but also help to maintain the quality of water for municipal and recreational uses and for fish and wildlife by minimizing the pollution of streams.

Because the soils and landscape features in the county vary greatly, a variety of erosion-control measures are needed. The most effective measures provide a protective cover of plants or crop residue, reduce the runoff rate, and increase the rate of water infiltration. They include cover crops, contour stripcropping, contour tillage, terraces and diversions, grassed waterways, and conservation tillage. Generally, a combination of several measures is needed.

A cropping system that leaves a protective plant cover on the surface for extended periods can hold soil losses to an amount that will not reduce the productive capacity of the soils. On livestock farms, where part of the acreage is hayland or pasture, forage crops of grasses and legumes not only provide nitrogen and improve tilth for the next cropping season but also provide a protective plant cover.

A conservation tillage system that leaves a protective amount of crop residue on the surface after planting is effective in controlling erosion, especially on the more sloping soils. No-tillage, also referred to as slot planting or zero tillage, is a system in which the seedbed is prepared and the seed planted in one operation. The surface is disturbed only in the immediate area of the planted row of seeds. A protective cover of crop residue is left on at least 90 percent of the surface. Strip tillage, or till plant, also is a system in which the seedbed is prepared and the seed planted in one operation. Tillage is limited to a strip not wider than one-third of the row. A protective cover of crop residue is left on two-thirds of the surface. Chisel-disk, or rotary tillage, is a system in which the soil is loosened throughout the field and part of the crop residue is incorporated into the soil. The seedbed is prepared and the seed planted in one or two operations.

Terraces and diversions help to control runoff and erosion by reducing the length of slopes. They are most effective on well drained or moderately well drained, gently sloping or moderately sloping soils that have smooth slopes. They are less effective in areas where slopes are irregular or are too steep. Tile-intake terraces help to prevent the accumulation of runoff. If terraces are constructed on soils that formed in loess, such as the Downs, Fayette, and Tama soils, the incorporation of less fertile, more slowly permeable, adjacent soils, such as the Clarinda, Keswick, Gara, and Shelby soils, should be avoided or minimized. Because of the high content of clay in the more slowly permeable soils, designing and constructing the terraces and revegetating the terrace slopes are difficult and seepage can be a problem following construction. In areas of Shelby and other soils having a subsoil that formed partly or entirely in glacial till, the topsoil should be stockpiled when the terraces are constructed and the exposed subsoil should be covered with the stockpiled material after construction is completed. Diversion terraces commonly are constructed on foot slopes upslope from the Judson soils. They help to control runoff from the adjacent upland slopes.

Contour farming and contour stripcropping also help to control erosion in the county. They are most effective on soils that have smooth, uniform slopes, such as the Dinsdale and Tama soils. Gully-control structures, grassed waterways, and farm ponds help to control erosion in watercourses (fig. 9). The farm ponds also help to provide water for livestock and for recreational activities.

Soil blowing is a hazard on the Chelsea soils, which are sandy and are in scattered areas along the Iowa River. If the winds are strong and the soils are dry and bare, soil blowing can damage Chelsea soils in a short period. Row crops on these soils and on adjacent soils may also be damaged by the windblown sand grains. A plant cover, surface mulch, windbreaks, and tillage methods that keep the surface rough help to control soil blowing.

Information about measures that help to control erosion and soil blowing on each kind of soil is contained in the "Technical Guide," which is available at the local office of the Natural Resources Conservation Service.

The wetness is a major management concern on about 20 percent of the acreage in the county. A drainage system typically is needed on the Ackmore, Colo, and Zook soils on flood plains and on the Garwin, Sawmill, and Sperry soils in the uplands. Installing a drainage system in poorly drained or very poorly drained soils generally results in an increase in productivity and in the kinds of crops that can be grown. The drains should be more closely spaced in the moderately slowly permeable soils than in the more rapidly permeable soils. Slow or very slow permeability in the Clarinda and Keswick soils, which formed in a paleosol on uplands, commonly results in seepy areas in the surrounding soils. Installing lateral interceptor tile drains upslope from the slowly permeable or very slowly permeable soils helps to intercept and drain the excess water at the point where loess and glacial till are in contact.

Fertility is affected by the supply of available

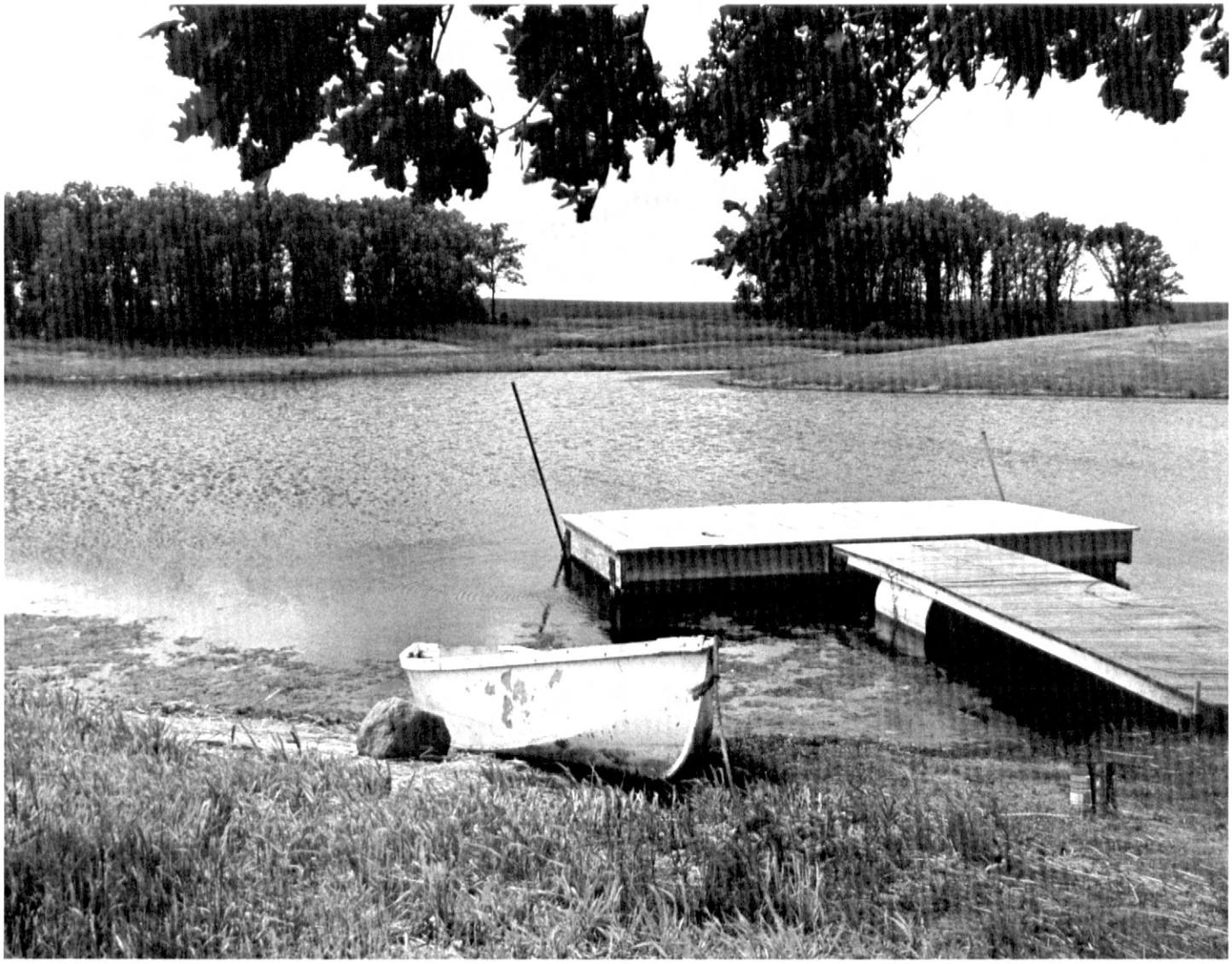

Figure 9.—A small pond in an area of Tama silty clay loam, 9 to 14 percent slopes, moderately eroded. The pond helps to control erosion in waterways downstream and provides water for recreational activities.

phosphorus and potassium in the subsoil, by reaction, and by the content of organic matter in the surface layer. The fertility level varies greatly in the soils in the county. In most of the soils, the supply of available phosphorus and potassium ranges from high to very low and reaction is neutral to very strongly acid.

Applications of ground limestone are needed on acid soils to promote the growth of plants. On all soils the kinds and amounts of lime and fertilizer needed should be determined by the results of soil tests, the needs of the crop, and the expected level of yields. Soil tests generally provide the most beneficial information. The Cooperative Extension Service can help in determining 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 with good tilth generally have a high content of organic matter and are granular and porous. In most of the uneroded upland soils that formed under prairie grasses, the content of organic matter in the surface layer is about 3.0 to 4.5 percent. In the eroded upland soils that formed under prairie grasses, it is about 1 to 3 percent, depending on the degree of erosion that has taken place. It is less than 1 to 3 percent in the Downs and Waubeek soils, which formed under mixed prairie

grasses and deciduous trees. Most of the soils on bottom land have the highest content of organic matter in the county. The content of organic matter is 4 to 7 percent in the bottom land soils that have a surface layer of silty clay loam. It is lower in the stratified soils that have a surface layer of silt loam. Ackmore and Nodaway soils are examples of soils that have a surface layer of silt loam. The regular additions of crop residue, manure, and other organic material improve soil structure and tilth and help to prevent the formation of a surface crust.

The soils that formed in glacial till, such as Gara, Lindley, Liscomb, and Shelby soils, commonly have an accumulation of large stones on the surface. These stones can hinder fieldwork unless they are removed.

Most of the permanent pastures in the county support bluegrass. Some are renovated and support birdsfoot trefoil or crownvetch. Other suitable species that are common in the pastured areas are brome, reed canarygrass, orchardgrass, switchgrass, big bluestem, indiangrass, alfalfa, red clover, and ladino clover. Most of the pastured areas are not used as cropland because the soils are too steep for cultivation. Measures that prevent overgrazing are needed, especially on steep slopes, to help prevent surface compaction and gully erosion. Maximum production of grasses and legumes can be achieved if the pasture is properly managed. Applications of fertilizer, weed and brush control, rotation and deferred grazing, proper stocking rates, and adequate livestock watering facilities help to keep the pasture in good condition.

Erosion is a severe hazard if the plant cover is destroyed when the more sloping pastures are renovated. Interseeding the grasses and legumes into the existing sod eliminates the need for destroying the plant cover during seedbed preparation. If cultivated crops are to be grown prior to seeding, soil losses can be minimized by conservation tillage, contour farming, and grassed waterways.

Many of the crops suited to the soils and climate of the county are not commonly grown. These crops include sorghum and milo, which are used mainly for silage; wheat; barley; various pasture grasses; various native grasses, such as bluestem, switchgrass, and indiangrass, which produce grass seed; sweet corn; nursery stock; early vegetables; and some orchard crops. The latest information about managing the soils for these crops can be obtained from local offices of the Cooperative Extension Service and the Natural Resources Conservation Service.

Yields per Acre

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

About 128,700 acres in Tama County, or more than one-fourth of the total acreage, was woodland when the first settlers arrived. The early settlers cut down a large part of the timber when they cleared the land, which was then primarily farmed. Some of the timber was used for construction purposes, for fenceposts, or as firewood. By 1974, the acreage of woodland had declined to about 30,000 acres. Most of the land where the timber was cut down during the last 30 years is in highly erodible, moderately steep and steep areas. These areas are now used for agricultural purposes.

The principal species on uplands in the county are white oak, northern red oak, black oak, bur oak, shagbark hickory, white ash, and green ash. Those on bottom land and along drainageways include eastern cottonwood, silver maple, green ash, white ash, basswood, and black walnut. Black cherry, though common, is not plentiful, and river birch is in scattered areas along streams. American elm and red elm are abundant in number but generally are small in size because of the effects of Dutch elm disease. Most of the timber on uplands is in areas of the Downs, Fayette, Gara, and Lindley soils. Most of the timber on the bottom land is in areas of the Colo-Bremer-Nodaway association, which is described under the heading "General Soil Map Units."

Woodland owners tend to cut the most desirable species for lumber and furniture. The remaining woodland is of poorer quality because it is regenerated by the poorer quality trees and less desirable species left behind. Proper timber management increases the volume of more valuable wood and helps to ensure a consistent amount of firewood from year to year. It also greatly reduces the amount of soil lost through erosion and improves the habitat of wildlife.

Woodland can produce the best crop of wood only if the stand is well managed. It should be protected from fire and from destructive grazing. The desirable trees that have the best potential should be allowed to grow, and the undesirable trees and vines that compete with the best trees for moisture, nutrients, and light should be removed. After some of the best trees are harvested, their growing space can be used by younger, desirable trees. The volume harvested during a designated period should not exceed the growth of the remaining trees during the same period.

Most of the woodland in the county is lightly to heavily pastured. If livestock are allowed to graze in timber stands, they damage the base of large trees with their hooves, damage or destroy young trees, compact the soil, and selectively browse on certain young trees.

The suitability of different kinds of soil for trees varies greatly. The soil conditions under which different species can grow also vary greatly. Green ash, for example, can grow in a poorly drained soil and in a droughty soil on a south-facing slope. Most species that cannot grow on east-facing slopes are better suited to soils on south- or west-facing slopes. Generally, the deep, well drained or moderately well drained soils that are moderately fertile or highly fertile are well suited to trees. If the subsoil is slowly permeable, root development is restricted.

Further information about woodland management, tree planting, and insect and disease control can be obtained from the Tama County Soil Conservation District and from the Iowa Conservation Commission.

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

Tama County provides habitat for many kinds of wildlife. These wildlife resources have a positive effect on the local economy, mainly because of the opportunities for hunting and fishing resulting from the kind and abundance of wildlife in the county. Also, songbirds and hawks, owls, snakes, and other predators are beneficial because they control the population of rodents and undesirable insects.

The soils in the county indirectly affect the kind and abundance of wildlife through their effect on vegetation and land use, and topography affects wildlife through its effect on land use. The undisturbed vegetation in moderately steep and steep areas, such as many areas of the Fayette soils, is valuable to wildlife. Planting suitable vegetation where needed on the more sloping prairie soils, such as the Shelby soils, can improve the habitat for the desirable kinds of wildlife. The nearly level Garwin and Muscatine soils generally are cropped intensively. They provide limited shelter and nesting areas for wildlife, but they also provide corn and small grain for feed. Much of the wildlife in the county inhabits areas of the strongly sloping to steep Downs, Fayette, and Lindley soils in the uplands. Because these soils are along streams throughout the county, the wildlife is well distributed.

Pheasants, hungarian partridge, opossum, raccoon, squirrel, and cottontail rabbit generally are abundant in the uplands of the Tama and Dinsdale-Tama associations. White-tailed deer are in areas of the Colo-Bremer-Nodaway and Fayette-Downs associations. Muskrat, mink, and beaver are in creeks throughout the county. They probably are most numerous in areas of the Colo-Bremer-Nodaway association.

Fish, mainly bullheads and carp, are fairly plentiful in the major streams. Many privately owned ponds, which range from 0.5 acre to 15.0 acres in size, are well distributed throughout the county. Some well managed ponds provide excellent habitat for bass, bluegill, and catfish. Drainage, available water capacity, texture of the subsoil, and permeability are important factors affecting the selection of sites for stocked farm ponds and the development of habitat for waterfowl. Several watershed structures provide excellent opportunities for fishing and enhance the habitat of wildlife.

Several county and State parks, which support an abundant wildlife population, are in the county. The three larger parks are Hickory Hills, Otter Creek, and Union Grove. Hickory Hills Park is in the northeast

corner of the county. It covers a 1,000-acre area and includes a 45-acre lake. Otter Creek Park is in the central part of the county. It covers an 800-acre area and includes an 80-acre lake. Union Grove Park is in the northwestern part of the county between Garwin and Gladbrook. It covers a 700-acre area and includes a 100-acre lake. These three parks are in areas of the Fayette-Downs association. The lakes provide excellent fishing opportunities throughout the year. They are stocked with bass, bluegill, catfish, and crappies. Footpaths, or nature trails, in the parks provide excellent opportunities for observing songbirds, hawks, owls, raccoon, squirrels, and other wildlife. Excellent examples of vegetation also can be seen in the parks. The trees along the nature trails include bur oak, red oak, shagbark hickory, and basswood.

Otter Creek Marsh is located in the southeastern part of the county, about 2 miles west of the town of Chelsea on County Highway E66 (fig. 10). It is made up of about 3,360 acres on the flood plain of Otter Creek and the Iowa River in the Colo-Bremer-Nodaway association. About 1,500 acres of marsh is maintained along the channel of Otter Creek by a series of dikes and dams built along the channel. In the fall most of Otter Creek Marsh is open to the hunting of waterfowl. In years of plentiful water supplies, the population of ducks commonly is 15,000 or more. Mallards, pintails, wood ducks, and widgeons are the more common ducks found in the marsh.

A portion of Otter Creek Marsh is a refuge for wildlife. This refuge is the key to successful management of the marsh. In the fall during the heaviest part of the hunting season, it provides wildlife with an area for feeding and resting. Although the area was primarily established for waterfowl, visitors and nongame enthusiasts will find many other types of wildlife as well. Goldfinch, indigo bunting, bobolink, and other songbirds and bald eagles, great blue heron, and owls are some of the other birds that inhabit Otter Creek Marsh. Fur-bearing animals, such as mink, muskrat, and raccoon, are abundant in the area of the marsh. Beaver and fox are abundant in the areas surrounding the marsh. Many fur pelts are taken by trapping each year in and around Otter Creek Marsh. Twenty river otters were purchased from the Louisiana Game Commission and released at the marsh in 1986. The river otter was once abundant in Iowa, and Otter Creek Marsh was one of the first areas in Iowa to have the otter reintroduced in many years.

Although many areas in the county are suitable as wildlife habitat, many more could be improved or developed. Generally, some of the soils on every farm could provide wildlife with good quality habitat if the soils are properly managed. Small, irregularly shaped areas, which have limited value for other uses, can be developed as wildlife habitat. Examples are many areas of the strongly sloping to steep Armstrong, Gara, and Lindley soils. Brushy or wooded areas can be fenced so that food and cover are not destroyed by livestock, and the borders of fields can be planted to grasses and legumes. The vegetation in the borders should not be clipped, especially during the nesting season for upland birds.

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.

Figure 10.—An area of Colo soils in a marsh along Otter Creek developed to provide nests and food for waterfowl during fall migration.

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 kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

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

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

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

Building Site Development

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

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

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

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

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

Sanitary Facilities

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

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

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils.

Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

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

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

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

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

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

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

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

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

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

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

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

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within

their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

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

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

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

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

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

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

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

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

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

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

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

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; 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, or 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.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(3)* and the system adopted by the American Association of State Highway and Transportation Officials *(2)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 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 coarse 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, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance

of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(12)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 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 Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquolls (*Hapl*, meaning minimal horizonation, plus *aquoll*, the suborder of the Mollisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Haplaquolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(13)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(12)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Ackmore Series

The Ackmore series consists of somewhat poorly drained, moderately permeable soils on flood plains and in upland drainageways. These soils formed in stratified silty alluvium and in the underlying buried soil. The

native vegetation is water-tolerant grasses. Slopes range from 0 to 5 percent.

Typical pedon of Ackmore silt loam, 0 to 2 percent slopes, in an area of cropland; 900 feet south and 2,420 feet east of the center of sec. 27, T. 86 N., R. 15 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam (about 21 percent clay) that has thin brown (10YR 5/3) strata, dark gray (10YR 4/1) dry; very weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

C1—7 to 16 inches; very dark grayish brown (10YR 3/2) silt loam (about 21 percent clay) that has thin brown (10YR 5/3) strata; massive; friable; slightly acid; clear smooth boundary.

C2—16 to 27 inches; very dark gray (10YR 3/1) silt loam (about 21 percent clay) that has thin black (10YR 2/1) and brown (10YR 5/3) strata; few fine distinct strong brown (7.5YR 5/6) mottles; massive; friable; slightly acid; abrupt wavy boundary.

2Ab1—27 to 49 inches; black (N 2/0) silty clay loam (about 29 percent clay); moderate medium granular and weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

2Ab2—49 to 60 inches; very dark gray (10YR 3/1) silty clay loam (about 29 percent clay); few fine distinct light olive brown (2.5Y 5/4) and olive gray (5Y 5/2) mottles; moderate fine subangular blocky structure; friable; neutral.

The combined thickness of the A and C horizons ranges from 20 to 36 inches. The A horizon is very dark grayish brown (10YR 3/2) or very dark gray (10YR 3/1). The C horizon has chroma of 1 or 2. The strata in the A and C horizons have hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The content of clay in the A and C horizons typically is 18 to 28 percent. The 2Ab horizon has hue of 10YR or 5Y, value of 2 or 3, and chroma of 1 or 2. The content of clay in the 2Ab horizon ranges from 27 to 38 percent.

Armstrong Series

The Armstrong series consists of moderately well drained, slowly permeable soils on convex upland side slopes. These soils formed in a paleosol derived from glacial till. The native vegetation is mixed prairie grasses and deciduous trees. Slopes range from 14 to 18 percent.

Typical pedon of Armstrong silt loam, in an area of Gara-Armstrong complex, 14 to 18 percent slopes, moderately eroded, used for crops; 700 feet west and 100 feet south of the northeast corner of sec. 24, T. 82 N., R. 16 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam (about 21 percent clay), grayish brown (10YR 5/2) dry; some streaks and pockets of yellowish brown (10YR 5/4) subsurface material; weak fine granular structure; friable; neutral; abrupt smooth boundary.

BE—7 to 15 inches; yellowish brown (10YR 5/4) silt loam (about 21 percent clay); weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

2Bt1—15 to 21 inches; brown (7.5YR 4/4) clay loam (about 38 percent clay); common fine distinct red (2.5YR 4/6) and few fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; very firm; common distinct clay films on faces of peds; a stone line in the upper part; 2 or 3 percent coarse fragments; neutral; gradual smooth boundary.

2Bt2—21 to 34 inches; strong brown (7.5YR 5/6) clay loam (about 38 percent clay); few fine distinct yellowish red (5YR 5/6) and grayish brown (10YR 5/2) mottles; weak fine prismatic structure parting to weak medium subangular blocky; firm; common distinct clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; 2 or 3 percent coarse fragments; medium acid; gradual smooth boundary.

2Bt3—34 to 43 inches; strong brown (7.5YR 5/6) clay loam (about 38 percent clay); few fine distinct yellowish red (5YR 5/6) and grayish brown (10YR 5/2) mottles; weak medium prismatic structure; firm; common faint clay films on faces of prisms; few distinct light gray (10YR 7/1) silt coatings on faces of prisms; few fine dark concretions of iron and manganese oxide; 2 or 3 percent coarse fragments; medium acid; gradual smooth boundary.

2C—43 to 60 inches; yellowish brown (10YR 5/6) clay loam (about 29 percent clay); few fine distinct gray (10YR 5/1) and yellowish red (5YR 5/6) mottles; massive; firm; many fine dark concretions and stains of iron and manganese oxide; 2 or 3 percent coarse fragments; medium acid.

The thickness of the solum ranges from 42 to more than 60 inches. Glacial stones and pebbles occur throughout the solum. A stone line or a band of pebbles is at the upper boundary of the paleosol.

The Ap horizon typically is very dark grayish brown (10YR 3/2) but is very dark gray (10YR 3/1) in some pedons. It is silt loam or silty clay loam. The 2Bt horizon is reddish or has reddish mottles. It typically has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 3 to 6. It commonly is 18 to 32 inches thick. The content of clay in the 2Bt horizon ranges from 36 to 48 percent.

The Armstrong soil in map unit 993E3 is a taxadjunct to the series because it has a lighter colored surface layer than is definitive for the series. It classifies as a fine, montmorillonitic, mesic Typic Hapludalf.

Atterberry Series

The Atterberry series consists of somewhat poorly drained, moderately permeable soils on broad, nearly level upland ridgetops. These soils formed in loess. The native vegetation is mixed prairie grasses and hardwoods. Slopes range from 0 to 2 percent.

The Atterberry soils in this county are taxadjuncts to the series because they have a grayer subsoil than is definitive for the series. The depth to the water table, however, is typical of the Atterberry series. In this county the Atterberry soils classify as fine-silty, mixed, mesic Mollic Ochraqualfs.

Typical pedon of Atterberry silt loam, 0 to 2 percent slopes, in an area of cropland; 1,400 feet east and 280 feet south of the center of sec. 1, T. 83 N., R. 16 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam (about 25 percent clay), grayish brown (10YR 5/2) dry; weak fine granular and weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

E—8 to 14 inches; dark grayish brown (10YR 4/2) silt loam (about 24 percent clay), light brownish gray (10YR 6/2) dry; very dark gray (10YR 3/1) coatings on faces of peds; weak thin platy structure parting to weak fine subangular blocky; friable; neutral; clear smooth boundary.

BE—14 to 19 inches; dark grayish brown (10YR 4/2) silty clay loam (about 28 percent clay); few distinct very dark gray (10YR 3/1) coatings on faces of peds; few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; few distinct light gray (10YR 7/1) silt coatings on faces of peds; slightly acid; clear smooth boundary.

Btg1—19 to 26 inches; dark grayish brown (10YR 4/2) silty clay loam (about 34 percent clay); few fine distinct yellowish brown (10YR 5/8 and 5/6) mottles; strong fine angular and subangular blocky structure; friable; few faint clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; medium acid; clear smooth boundary.

Btg2—26 to 34 inches; grayish brown (2.5Y 5/2) silty clay loam (about 32 percent clay); few medium distinct yellowish brown (10YR 5/8) mottles; moderate fine prismatic structure parting to moderate fine subangular blocky; friable; few faint clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; few dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg3—34 to 44 inches; grayish brown (2.5Y 5/2) silty clay loam (about 29 percent clay); few medium distinct strong brown (7.5YR 5/8) mottles; weak medium prismatic structure; friable; few faint clay films on faces of peds; few fine dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

C—44 to 60 inches; light brownish gray (10YR 6/2) silt loam (about 26 percent clay); common medium strong brown (7.5YR 5/8) mottles; massive; friable; few fine dark concretions of iron and manganese oxide; very dark gray (10YR 3/1) fillings in worm channels; neutral.

The thickness of the solum ranges from 40 to 60 inches. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is 6 to 9 inches thick. The E horizon has chroma of 2 or 3. It typically is 3 to 8 inches thick, but in some pedons it has been partially incorporated into the Ap horizon. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is silty clay loam that contains 28 to 35 percent clay. The BC and C horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. They are silt loam or silty clay loam.

Bolan Series

The Bolan series consists of well drained soils on upland ridgetops and side slopes. These soils formed in loamy eolian material 30 to 48 inches deep over sandy eolian material. The native vegetation is tall prairie grasses. Permeability is moderate in the upper part of the solum and rapid in the substratum. Slopes range from 2 to 9 percent.

Typical pedon of Bolan loam 5 to 9 percent slopes, in an area of cropland; 740 feet north and 150 feet east of the southwest corner of sec. 23, T. 82 N., R. 14 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) loam, very dark grayish brown (10YR 3/2) dry; weak fine granular and weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

AB—8 to 13 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; few faint very dark brown (10YR 2/2) coatings on faces of peds; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bw1—13 to 20 inches; brown (10YR 4/3) loam; few distinct very dark grayish brown (10YR 3/2) coatings on faces of peds; weak fine and medium subangular blocky structure; friable; medium acid; clear smooth boundary.

Bw2—20 to 25 inches; dark yellowish brown (10YR 4/4) loam; few faint dark brown (10YR 3/3) coatings on faces of peds; friable; few very dark grayish brown (10YR 3/2) wormcasts; medium acid; clear smooth boundary.

BC—25 to 34 inches; dark yellowish brown (10YR 4/4) fine sandy loam; very weak medium subangular blocky structure; friable; some clay bridges between sand grains; medium acid; clear smooth boundary.

2C1—34 to 42 inches; dark yellowish brown (10YR 4/4) loamy fine sand; single grain; loose; some clay bridges between sand grains; 0.5- to 1.0-inch strong brown (7.5YR 5/6) lamellae at depths of 38 and 40 inches; medium acid; gradual smooth boundary.

2C2—42 to 60 inches; light yellowish brown (10YR 6/4) fine sand; single grain; loose; 0.5- to 1.0-inch strong brown (7.5YR 5/6) lamellae at depths of 46, 49, and 56 inches; medium acid.

The thickness of the solum ranges from 30 to 48 inches. Reaction typically is neutral to medium acid.

The A horizon typically is loam, but the range includes silt loam that is high in content of sand. The Bw and BC horizons are loam or fine sandy loam. They have hue of 10YR, value of 3 to 6, and chroma of 4 to 6. The 2C horizon is loamy fine sand or fine sand. It has hue of 10YR, value of 4 or 5, and chroma of 3 to 6.

Bremer Series

The Bremer series consists of poorly drained, moderately slowly permeable soils on low terraces. These soils formed in silty alluvium. The native vegetation is water-tolerant grasses. Slopes range from 0 to 2 percent.

Typical pedon of Bremer silty clay loam, 0 to 2 percent slopes, in an area of cropland; 2,140 feet south and 1,420 feet east of the northwest corner of sec. 33, T. 83 N., R. 14 W.

Ap—0 to 8 inches; black (N 2/0) silty clay loam (30 percent clay), very dark gray (10YR 3/1) dry; weak very fine and fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

A—8 to 18 inches; black (N 2/0) silty clay loam (32 percent clay), very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure parting to weak fine granular; friable; few fine roots; slightly acid; gradual smooth boundary.

Bt—18 to 30 inches; very dark gray (10YR 3/1) silty clay (40 percent clay), dark gray (10YR 4/1) dry; few distinct black (N 2/0) coatings on faces of peds; weak fine prismatic structure parting to moderate fine and medium subangular blocky; firm; common distinct clay films on faces of peds; few fine roots; slightly acid; gradual smooth boundary.

Btg—30 to 41 inches; dark gray (5Y 4/1) silty clay loam (38 percent clay); few distinct black (N 2/0) coatings on faces of peds; weak fine prismatic structure parting to moderate medium subangular blocky; firm; few distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

Cg—41 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam (39 percent clay); common fine distinct yellowish brown (10YR 5/8) mottles; appears massive with some vertical cleavage planes; friable; few distinct very dark gray (10YR 3/1) clay films along vertical cleavage faces in the upper part; few fine dark accumulations of iron and manganese oxide; slightly acid.

The thickness of the solum ranges from 40 to 60 inches. Reaction is slightly acid or neutral.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It typically is silty clay loam, but the range includes silt loam. The upper part of the B horizon has hue of 10YR, 2.5Y, or 5Y. It commonly has value of 3; however, value increases to 4 or 5 with increasing depth. The B horizon typically is silty clay loam, but the range includes silty clay. The average content of clay in the B horizon ranges from 36 to 40 percent. The Cg horizon has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 1 or 2.

Canoe Series

The Canoe series consists of somewhat poorly drained, moderately permeable soils on high terraces. These soils formed in silty alluvium. The native vegetation is deciduous trees and tall prairie grasses. Slopes range from 0 to 2 percent.

The Canoe soil in this county is a taxadjunct to the series because it has a grayer subsoil than is definitive for the series. The depth to the water table, however, is typical of the Canoe series. In this county the soil classifies as a fine-silty, mixed, mesic Mollic Ochraqualf.

Typical pedon of Canoe silt loam, 0 to 2 percent slopes, in an area of cropland; 250 feet east and 40 feet north of the southwest corner of sec. 12, T. 82 N., R. 13 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) silt loam (about 21 percent clay), dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

E1—8 to 15 inches; dark grayish brown (10YR 4/2) silt loam (about 21 percent clay), light brownish gray (10YR 6/2) dry; weak thin platy structure; friable; few fine dark concretions of iron and manganese

oxide; neutral; clear smooth boundary.
E2—15 to 20 inches; dark grayish brown (10YR 4/2) silt loam (about 21 percent clay), light brownish gray (10YR 6/2) dry; few fine distinct strong brown (7.5YR 4/6) mottles; weak thin platy structure parting to weak very fine subangular blocky; friable; few distinct light gray (10YR 7/1) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; slightly acid; clear smooth boundary.
BE—20 to 26 inches; grayish brown (2.5Y 5/2) silt loam (about 26 percent clay); common fine distinct strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; friable; few distinct light gray (10YR 7/1) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.
Bt1—26 to 36 inches; grayish brown (2.5Y 5/2) silt loam (about 26 percent clay); common fine distinct strong brown (7.5YR 5/6) mottles; weak fine prismatic structure parting to moderate fine and medium subangular blocky; friable; few faint clay films on faces of peds; common distinct light gray (10YR 7/1) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.
Bt2—36 to 44 inches; grayish brown (2.5Y 5/2) silt loam (about 26 percent clay); common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; friable; few faint clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.
C—44 to 60 inches; grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) silt loam (about 21 percent clay); appears massive with some vertical cleavage planes; friable; few distinct strong brown (7.5YR 4/6) clay flows on cleavage planes; few fine dark concretions of iron and manganese oxide; medium acid.

The thickness of the solum ranges from 40 to 60 inches. The depth to carbonates is 70 inches or more.

The Ap or A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bt horizon has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 2. It typically is silt loam, but the range includes silty clay loam.

Chelsea Series

The Chelsea series consists of excessively drained, rapidly permeable soils on upland ridgetops and side slopes. These soils formed in sandy eolian material. The native vegetation is hardwood forest. Slopes range from 5 to 40 percent.

Typical pedon of Chelsea loamy fine sand, in a wooded area of Chelsea-Lamont-Fayette complex, 9 to 14 percent slopes; 300 feet east and 2,120 feet north of the southwest corner of sec. 5, T. 83 N., R. 16 W.

A—0 to 4 inches; very dark gray (10YR 3/1) loamy fine sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; slightly acid; clear smooth boundary.
E1—4 to 12 inches; brown (10YR 4/3) loamy fine sand, light brownish gray (10YR 6/2) dry; few distinct very dark gray (10YR 3/1) coatings on faces of peds in the upper part; weak thin platy structure; very friable; slightly acid; clear smooth boundary.
E2—12 to 29 inches; yellowish brown (10YR 5/6) fine sand, light yellowish brown (10YR 6/4) dry; single grain; loose; medium acid; gradual smooth boundary.
E3—29 to 42 inches; brownish yellow (10YR 6/6) fine sand, very pale brown (10YR 7/4) dry; few fine faint yellowish brown (10YR 5/6) mottles; single grain; loose; strongly acid; gradual smooth boundary.
E&Bt—42 to 60 inches; light yellowish brown (10YR 6/4) fine sand (E); single grain; loose; 0.5- to 2.0-inch-thick lamellae of strong brown (7.5YR 5/6) sandy loam (Bt) at depths of 42, 48, 55, and 60 inches; strongly acid.

The thickness of the solum ranges from 4 to 8 feet. The sand dominantly is fine or medium.

The A horizon has chroma of 1 or 2. It is 2 to 5 inches thick. It is dominantly loamy fine sand, but the range includes loamy sand, sand, and fine sand. The Ap horizon, if it occurs, has value of 3 or 4 and chroma of 2 or 3. The E horizon has value of 4 to 6 and chroma of 2 to 6. The E part of the E&Bt horizon has chroma of 3 to 6. It is sand or fine sand. The Bt part occurs as 0.25- to 3.0-inch-thick lamellae. It has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is sandy loam or loamy sand.

Clarinda Series

The Clarinda series consists of poorly drained, very slowly permeable soils on upland side slopes and in coves at the head of drainageways. These soils formed in a gray, clayey paleosol derived from glacial till. The native vegetation is tall prairie grasses. Slopes range from 9 to 14 percent.

The Clarinda soil in this county is a taxadjunct to the series because it does not have the mollic epipedon that is definitive for the Clarinda series. In this county

the soil classifies as a fine, montmorillonitic, mesic, sloping Mollic Ochraqualf.

Typical pedon of Clarinda silty clay loam, 9 to 14 percent slopes, moderately eroded, in an area of cropland; 400 feet west and 600 feet north of the southeast corner of sec. 34, T. 82 N., R. 16 W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay loam (about 28 percent clay), brown (10YR 5/3) dry; streaks and pockets of brown (10YR 5/3) soil material; few faint very dark brown (10YR 2/2) coatings on faces of peds; weak fine granular structure; friable; neutral; abrupt smooth boundary.

BA—6 to 9 inches; brown (10YR 5/3) silty clay loam (about 28 percent clay); streaks and pockets of very dark grayish brown (10YR 3/2) surface soil material; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

2Btg1—9 to 14 inches; gray (10YR 5/1) silty clay loam (about 38 percent clay); common medium dark yellowish brown (10YR 4/4) mottles; moderate fine subangular blocky structure; firm; few distinct clay films on faces of peds; medium acid; clear smooth boundary.

2Btg2—14 to 33 inches; gray (5Y 5/1) clay (about 50 percent clay); few fine distinct strong brown (7.5YR 4/6) mottles; moderate fine subangular blocky structure; firm; common distinct clay films on faces of peds; medium acid; gradual smooth boundary.

2Btg3—33 to 47 inches; gray (5Y 5/1) clay (about 50 percent clay); few fine distinct yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; firm; common distinct clay films on faces of peds; few distinct white (10YR 8/1) uncoated sand grains; medium acid; gradual smooth boundary.

2BCg—47 to 60 inches; olive gray (5Y 5/2) clay loam (about 38 percent clay); common medium yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few or common distinct white (10YR 8/1) uncoated sand grains; medium acid.

The solum commonly is more than 5 feet thick. The loess dominantly ranges from 8 to 18 inches in thickness, but in some severely eroded areas, it is less than 8 inches thick.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The 2Bt horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2. It is silty clay or clay. The maximum content of clay in the 2Bt horizon ranges from 45 to 58 percent.

Colo Series

The Colo series consists of poorly drained, moderately permeable soils on flood plains and in upland waterways (fig. 11). These soils formed in silty alluvium. The native vegetation is water-tolerant grasses. Slopes range from 0 to 5 percent.

Typical pedon of Colo silty clay loam, 0 to 2 percent slopes, in an area of cropland; 790 feet west and 1,920 feet north of the southeast corner of sec. 12, T. 85 N., R. 15 W.

Ap—0 to 8 inches; black (N 2/0) silty clay loam (31 percent clay), black (10YR 2/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; medium acid; gradual smooth boundary.

A1—8 to 14 inches; black (N 2/0) silty clay loam (33 percent clay), black (10YR 2/1) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; medium acid; gradual smooth boundary.

A2—14 to 23 inches; black (N 2/0) silty clay loam (32 percent clay), very dark gray (10YR 3/1) dry; weak medium subangular blocky structure parting to weak fine granular; friable; slightly acid; gradual smooth boundary.

A3—23 to 34 inches; black (10YR 2/1) silty clay loam (34 percent clay), very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; slightly acid; gradual smooth boundary.

BA—34 to 40 inches; very dark gray (10YR 3/1) silty clay loam (34 percent clay), dark gray (10YR 4/1) dry; weak medium subangular blocky structure; friable; slightly acid; gradual smooth boundary.

Bg—40 to 46 inches; very dark gray (10YR 3/1) silty clay loam (30 percent clay), dark gray (10YR 4/1) and gray (10YR 5/1) dry; weak medium prismatic structure parting to weak medium subangular blocky; friable; slightly acid; gradual smooth boundary.

BCg—46 to 52 inches; dark gray (10YR 4/1) silty clay loam (29 percent clay); weak coarse prismatic structure parting to weak medium subangular blocky; friable; slightly acid; gradual smooth boundary.

Cg—52 to 60 inches; dark gray (10YR 4/1) silt loam (26 percent clay); few fine distinct brown (7.5YR 5/4) mottles; appears massive with some vertical cleavage planes; friable; slightly acid.

The thickness of the solum ranges from about 36 to 60 inches. Carbonates are not in the solum and commonly are not within a depth of 60 inches. The

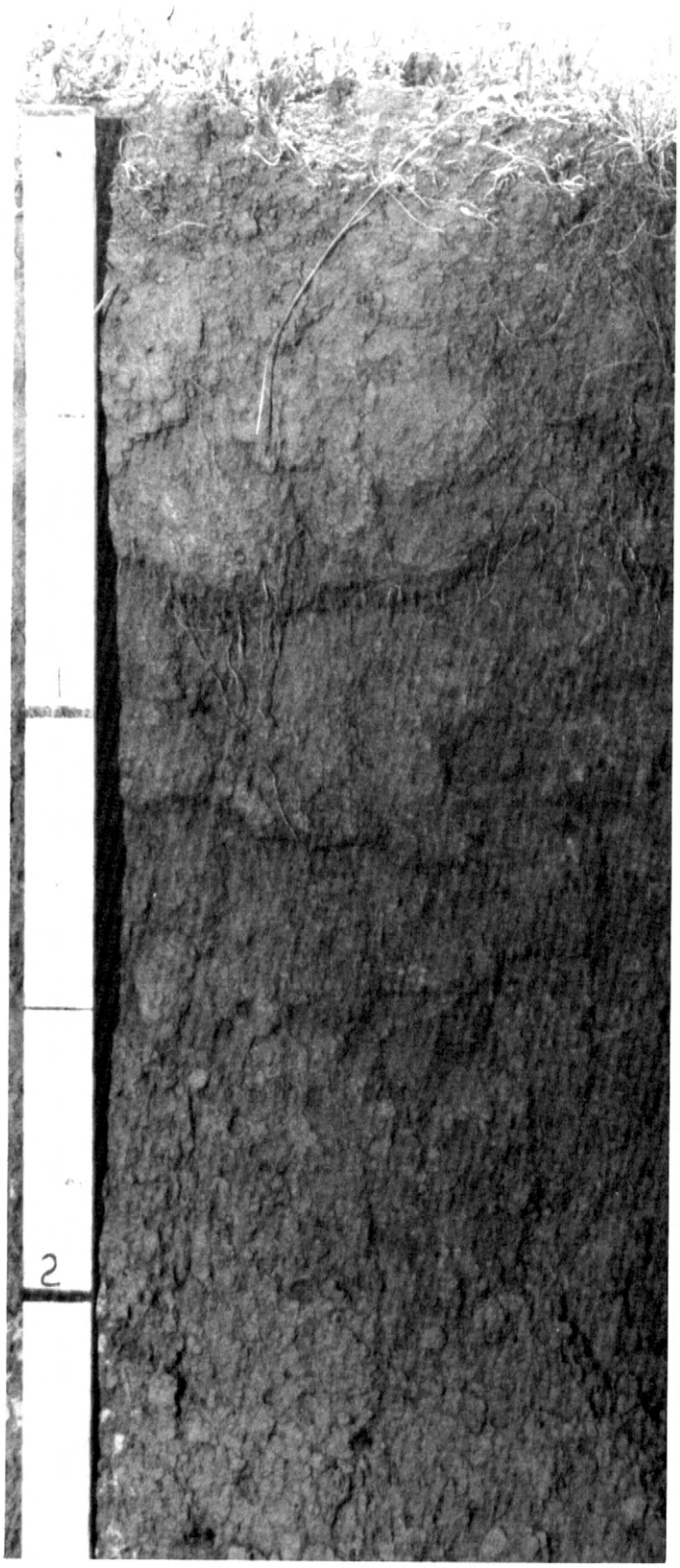

Figure 11.—A profile of Colo silty clay loam, 0 to 2 percent slopes.

mollic epipedon is 36 or more inches thick. Some pedons have 6 to 18 inches of stratified overwash sediments, which have hue of 10YR, value of 3 to 6, and chroma of 1 or 2. The 10- to 40-inch control section averages less than 35 percent clay; however, the content of clay is 36 to 40 percent in some horizons.

The A horizon typically has hue of 10YR or 5Y or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. The Bg horizon has value of 2 or 3. The BCg and Cg horizons have hue of 10YR or 5Y, value of 3 to 5, and chroma of 2 or less. They are silty clay loam that contains 30 to 35 percent clay. The Cg horizon is silty clay loam or silt loam. It has 25 to 35 percent clay.

Dickinson Series

The Dickinson series consists of well drained and somewhat excessively drained, moderately rapidly permeable soils on uplands and stream benches. These soils formed in deposits that have been reworked by wind. The native vegetation is mixed prairie grasses. Slopes range from 2 to 9 percent.

Typical pedon of Dickinson fine sandy loam, 2 to 5 percent slopes, in an area of cropland; 2,280 feet west and 520 feet south of the northeast corner of sec. 28, T. 83 N., R. 14 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

A—8 to 13 inches; very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; few faint very dark brown (10YR 2/2) coatings on faces of peds; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bw—13 to 23 inches; brown (10YR 4/3) and dark brown (10YR 3/3) fine sandy loam; few faint very dark grayish brown (10YR 3/2) coatings on faces of peds; weak fine subangular blocky structure; very friable; slightly acid; clear smooth boundary.

BC—23 to 29 inches; dark yellowish brown (10YR 4/4) loamy fine sand; weak medium subangular blocky structure; very friable; slightly acid; gradual smooth boundary.

C1—29 to 44 inches; yellowish brown (10YR 5/4) and light yellowish brown (10YR 6/4) loamy fine sand; single grain; loose; medium acid; gradual smooth boundary.

C2—44 to 60 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; thin bands of yellowish brown (10YR 5/6) sandy loam in the lower part; medium acid.

The solum typically ranges from 24 to 42 inches in thickness; however, it is as thick as 50 inches in places. The depth to loamy sand or sand commonly ranges from 20 to 36 inches. The sand particles dominantly are fine or medium. The profile typically does not contain gravel.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The Bw horizon typically has hue of 10YR, value of 3 to 5, and chroma of 3 to 6. In some pedons, however, it has hue of 7.5YR.

Dinsdale Series

The Dinsdale series consists of well drained, moderately permeable soils on convex upland ridgetops and side slopes. These soils formed in loess and in the underlying glacial till. The native vegetation is tall prairie grasses. Slopes range from 2 to 14 percent.

Typical pedon of Dinsdale silty clay loam, 2 to 5 percent slopes, in an area of cropland; 2,600 feet north and 100 feet west of the southeast corner of sec. 2, T. 84 N., R. 13 W.

Ap—0 to 7 inches; very dark brown (10YR 2/2) silty clay loam (about 28 percent clay), very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A—7 to 13 inches; very dark brown (10YR 2/2) and very dark grayish brown (10YR 3/2) silty clay loam (about 28 percent clay), very dark grayish brown (10YR 3/2) dry; weak fine and very fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

AB—13 to 20 inches; very dark grayish brown (10YR 3/2) silty clay loam (about 28 percent clay), brown (10YR 4/3) dry; some streaks and pockets of brown (10YR 4/3) subsoil material; few faint very dark brown (10YR 2/2) coatings on faces of peds; moderate fine and very fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

Bt1—20 to 26 inches; dark yellowish brown (10YR 4/4) silty clay loam (about 34 percent clay); few faint dark brown (10YR 3/3) coatings on faces of peds; moderate fine subangular blocky structure; friable; few faint dark brown (10YR 4/3) clay coatings on faces of peds; medium acid; gradual smooth boundary.

Bt2—26 to 37 inches; dark yellowish brown (10YR 4/4) silty clay loam (about 34 percent clay); few fine faint brown (10YR 5/3) and yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; few faint dark brown (10YR 4/3) clay coatings on faces of peds; medium acid; abrupt wavy boundary.

2BC—37 to 53 inches; dark yellowish brown (10YR 4/4) loam (about 25 percent clay); few fine faint strong brown (7.5YR 5/6) and brown (10YR 5/3) mottles; weak medium prismatic structure; firm; few fine dark concretions of iron and manganese oxide; a stone line with 0.5- to 2.0-inch-diameter stones in the upper part; neutral; abrupt smooth boundary.

2C—53 to 60 inches; dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) loam (about 25 percent clay); few fine and medium faint strong brown (7.5YR 5/6) and grayish brown (10YR 5/2) mottles; massive; firm; common fine dark concretions of iron and manganese oxide; weak effervescence; mildly alkaline.

The thickness of the solum ranges from 42 to 60 inches. The thickness of the loess deposit typically is 20 to 40 inches but ranges from 18 to 42 inches.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The upper part of the B horizon has hue of 10YR and value and chroma of 3 or 4. The 2BC horizon has value of 4 or 5 and chroma of 3 to 6. It typically is loam, but the range includes sandy clay loam.

The Dinsdale soils in map units 377B2, 377C2, 377D2, and 377D3 are taxadjuncts to the series because they do not have the mollic epipedon that is definitive for the series. They have a light colored Ap horizon that ranges from 3 to 9 inches in thickness. They classify as fine-silty, mixed, mesic Mollic Hapludalfs.

Downs Series

The Downs series consists of well drained, moderately permeable soils on upland ridgetops and side slopes. These soils formed in loess. The native vegetation is mixed prairie grasses and deciduous trees. Slopes range from 2 to 25 percent.

Typical pedon of Downs silt loam, 5 to 9 percent slopes, moderately eroded, in an area of cropland; 2,140 feet east and 20 feet south of the northwest corner of sec. 34, T. 86 N., R. 15 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam (about 21 percent clay), grayish brown (10YR 5/2) dry; some streaks and pockets of brown (10YR 4/3) subsoil material; weak fine and medium granular structure; friable; slightly acid; abrupt smooth boundary.

BE—7 to 12 inches; brown (10YR 4/3) silt loam (about 25 percent clay); weak fine and very fine subangular blocky structure; friable; common tubular pores; medium acid; clear smooth boundary.

Bt1—12 to 21 inches; dark yellowish brown (10YR 4/4) silty clay loam (about 33 percent clay); moderate

fine and medium subangular blocky structure; friable; few faint brown (10YR 4/3) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; many tubular pores; medium acid; gradual smooth boundary.

Bt2—21 to 32 inches; dark yellowish brown (10YR 4/4) silty clay loam (about 33 percent clay); weak fine prismatic structure parting to moderate fine subangular blocky; friable; few faint brown (10YR 4/3) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; many tubular pores; strongly acid; gradual smooth boundary.

Bt3—32 to 42 inches; yellowish brown (10YR 5/4) silty clay loam (about 33 percent clay); weak medium prismatic structure parting to moderate medium subangular blocky; friable; few distinct brown (7.5YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; many tubular pores; strongly acid; gradual smooth boundary.

Bt4—42 to 49 inches; yellowish brown (10YR 5/4) silty clay loam (about 29 percent clay); few medium distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure; friable; few distinct brown (7.5YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; many tubular pores; few fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

C—49 to 60 inches; yellowish brown (10YR 5/4) silt loam (about 25 percent clay); few fine distinct grayish brown (10YR 5/2) and few fine faint yellowish brown (10YR 5/6) mottles; massive; friable; many tubular pores; few fine dark concretions of iron and manganese oxide; medium acid.

The thickness of the solum ranges from 42 to more than 60 inches. These soils typically are leached of carbonates to a depth of at least 5 feet.

The A or Ap horizon ranges from 6 to 9 inches in thickness. It has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is silty clay loam that contains 29 to 35 percent clay. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6.

The Downs soils in map units 162D3, 162E3, 162F3, and 429E3 are taxadjuncts to the series because they do not have the mollic colored epipedon that is definitive for the series. They classify as fine-silty, mixed, mesic Typic Hapludalfs.

Ely Series

The Ely series consists of somewhat poorly drained, moderately permeable soils in upland waterways and on foot slopes. These soils formed in silty alluvium. The native vegetation is mixed prairie grasses. Slopes range from 2 to 5 percent.

Typical pedon of Ely silty clay loam, 2 to 5 percent slopes, in an area of cropland; 2,020 feet east and 420 feet south of the center of sec. 14, T. 82 N., R. 16 W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A—8 to 21 inches; black (10YR 2/1) silty clay loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

AB—21 to 29 inches; very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) silty clay loam, dark grayish brown (10YR 4/2) dry; few faint black (10YR 2/1) coatings on faces of peds; weak fine granular and weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bw1—29 to 36 inches; dark grayish brown (2.5Y 4/2) silty clay loam; few faint very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine faint yellowish brown (10YR 5/4) mottles; weak fine and medium subangular blocky structure; friable; few fine dark concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

Bw2—36 to 44 inches; grayish brown (10YR 5/2) silty clay loam; few fine distinct yellowish brown (10YR 5/6) and few fine faint gray (10YR 5/1) mottles; weak fine prismatic structure parting to weak medium subangular blocky; friable; few distinct light gray (10YR 7/1) coatings of silt and very fine sand on faces of peds; few fine dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

C—44 to 60 inches; grayish brown (10YR 5/2) silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; few fine dark concretions of iron and manganese oxide; slightly acid.

The thickness of the solum commonly is 40 to 60 inches but ranges to 70 inches. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It typically is silty clay loam, but the range includes silt loam. The Bw horizon has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 2 to 4. It is silty clay loam that contains 28 to 35 percent clay.

Emeline Series

The Emeline series consists of shallow and very shallow, somewhat excessively drained, moderately permeable soils on upland side slopes. These soils formed in loamy sediments overlying limestone bedrock. The native vegetation is prairie grasses and hardwoods. Slopes range from 25 to 40 percent.

Typical pedon of Emeline silt loam, in a wooded area of Emeline-Rock outcrop complex, 25 to 60 percent slopes; 1,040 feet north and 40 feet west of the southeast corner of sec. 4, T. 83 N., R. 16 W.

A—0 to 8 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular and weak medium subangular blocky structure; friable; few 15- to 25-millimeter fragments of partially weathered limestone in the lower 2 to 4 inches (about 15 percent of the soil volume); neutral; abrupt wavy boundary.

2R—8 inches; fractured, horizontally bedded limestone bedrock; dark silt loam sediments in the fractures in the upper part.

The thickness of the solum and the depth to limestone bedrock range from 4 to 12 inches. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It typically is silt loam, but the range includes loam and clay loam. Some pedons have a thin layer of silty clay residuum over the bedrock.

Fayette Series

The Fayette series consists of well drained, moderately permeable soils on upland ridgetops and side slopes. These soils formed in loess. The native vegetation is deciduous trees. Slopes range from 2 to 40 percent.

Typical pedon of Fayette silt loam, 5 to 9 percent slopes, moderately eroded, in an area of cropland; 2,200 feet east and 100 feet south of the northwest corner of sec. 15, T. 84 N., R. 16 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam (about 21 percent clay), light brownish gray (10YR 6/2) dry; some streaks and pockets of brown (10YR 4/3) subsoil material; weak fine granular and weak fine platy structure; friable; few tubular pores; medium acid; abrupt smooth boundary.

BE—6 to 12 inches; brown (10YR 4/3) silt loam (about 25 percent clay); few faint dark grayish brown (10YR 4/2) coatings on faces of peds; weak fine subangular blocky structure; friable; few wormcasts; few tubular pores; medium acid; clear smooth boundary.

Bt1—12 to 22 inches; dark yellowish brown (10YR 4/4) silty clay loam (about 33 percent clay); weak fine prismatic structure parting to moderate fine angular blocky; friable; common faint dark brown (10YR 4/3) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; many tubular pores; strongly acid; clear smooth boundary.

Bt2—22 to 32 inches; dark yellowish brown (10YR 4/4) silty clay loam (about 33 percent clay); weak medium prismatic structure parting to strong medium and fine angular blocky; friable; common faint dark brown (10YR 4/3) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; few fine black (10YR 2/1) concretions of iron and manganese oxide; common tubular pores; strongly acid; gradual smooth boundary.

Bt3—32 to 42 inches; yellowish brown (10YR 5/4) silty clay loam (about 29 percent clay); few fine distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; friable; few distinct dark brown (7.5YR 3/2) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; many tubular pores; few fine black (10YR 2/1) concretions of iron and manganese oxide; common tubular pores; strongly acid; gradual smooth boundary.

C—42 to 60 inches; yellowish brown (10YR 5/4) silt loam (about 25 percent clay); few fine distinct strong brown (7.5YR 5/8) and grayish brown (2.5Y 5/2) mottles; massive; friable; few distinct dark brown (7.5YR 3/2) clay films on cleavage planes in the upper part; few fine black (10YR 2/1) concretions of iron and manganese oxide; few tubular pores; medium acid.

The thickness of the solum typically is 42 to 50 inches, but it ranges from 36 to 60 inches. The solum is very strongly acid or strongly acid in the most acid part.

The A horizon has value of 3 and chroma of 1 or 2. It ranges from 2 to 5 inches in thickness. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The E horizon, if it occurs, has hue of 10YR, value of 4 or 5, and chroma of 1 to 4. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silty clay loam that contains 27 to 34 percent clay.

Festina Series

The Festina series consists of well drained, moderately permeable soils on high terraces. These soils formed in silty alluvium. The native vegetation is mixed deciduous trees and tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Festina silt loam, 0 to 2 percent

slopes, in a pastured area; 800 feet west and 220 feet north of the southeast corner of sec. 27, T. 82 N., R. 13 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam (about 21 percent clay), grayish brown (10YR 5/2) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

E—8 to 14 inches; brown (10YR 5/3) silt loam (about 21 percent clay), light brownish gray (10YR 6/2) dry; weak thin platy structure; friable; slightly acid; clear smooth boundary.

BE—14 to 20 inches; yellowish brown (10YR 5/4) silt loam (about 24 percent clay); weak fine subangular blocky structure; friable; few distinct light gray (10YR 7/1) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt1—20 to 29 inches; yellowish brown (10YR 5/4) silt loam (about 26 percent clay); weak fine prismatic structure parting to moderate fine and medium subangular blocky; friable; many faint dark yellowish brown (10YR 4/4) clay coatings on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt2—29 to 37 inches; yellowish brown (10YR 5/4) silt loam (about 26 percent clay); weak fine prismatic structure parting to moderate medium subangular blocky; friable; many faint dark yellowish brown (10YR 4/4) clay coatings on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; strongly acid; gradual smooth boundary.

BC—37 to 46 inches; yellowish brown (10YR 5/4) silt loam (about 24 percent clay); weak medium prismatic structure; friable; few distinct strong brown (7.5YR 4/6) clay coatings on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; strongly acid; gradual smooth boundary.

C—46 to 60 inches; yellowish brown (10YR 5/6) silt loam (about 24 percent clay); fine faint grayish brown (10YR 5/2) mottles; massive; friable; 2-inch-thick layer of sand at 56 inches; slightly acid.

The thickness of the solum typically is more than 42 inches, but it ranges from 36 to 60 inches. The content of sand in the solum ranges from 10 to 15 percent.

The A or Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 2. The E horizon is 4 to 8 inches thick. It has hue of 10YR, value of 2 or 3, and chroma of 4 or 5. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It typically is silt loam, but the range includes silty clay loam. The content of clay in the Bt horizon ranges from 24 to 29 percent.

Gara Series

The Gara series consists of well drained, moderately slowly permeable soils on convex upland side slopes. These soils formed in glacial till. The native vegetation is mixed deciduous trees and prairie grasses. Slopes range from 9 to 25 percent.

Typical pedon of Gara loam, in an area of Gara-Armstrong complex, 14 to 18 percent slopes, moderately eroded, used for crops; 695 feet west and 65 feet south of the northeast corner of sec. 24, T. 82 N., R. 16 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loam (about 21 percent clay), grayish brown (10YR 5/2) dry; some streaks and pockets of strong brown (7.5YR 5/6) subsoil material; weak fine granular and weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

Bt1—7 to 14 inches; strong brown (7.5YR 5/6) clay loam (about 33 percent clay); weak fine and medium subangular blocky structure; firm; few distinct reddish brown (5YR 4/4) clay films on faces of peds; few medium red concretions of iron oxide; neutral; clear smooth boundary.

Bt2—14 to 25 inches; strong brown (7.5YR 5/6) clay loam (about 33 percent clay); moderate medium subangular blocky structure; firm; few faint reddish brown (5YR 4/4) clay coatings on faces of peds; few distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; few pebbles and stones; few fine dark concretions of iron and manganese oxide; strongly acid; clear smooth boundary.

Bt3—25 to 33 inches; strong brown (7.5YR 5/6) clay loam (about 33 percent clay); strong fine and medium subangular blocky structure; firm; few faint yellowish red (5YR 4/6) clay coatings on faces of peds; few distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; few pebbles and stones; few fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Bt4—33 to 42 inches; strong brown (7.5YR 5/6) clay loam (about 33 percent clay); weak medium prismatic structure parting to moderate medium subangular blocky; firm; few distinct reddish brown (5YR 4/4) clay films on faces of peds; few distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; few pebbles and stones; few fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

BC—42 to 50 inches; yellowish brown (10YR 5/6) clay loam (about 29 percent clay); few fine distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure; firm; few distinct pale brown

(10YR 6/3) silt coatings on faces of peds; few pebbles and stones; common fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

C—50 to 60 inches; yellowish brown (10YR 5/6) clay loam (about 29 percent clay); common medium distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; massive; firm; few pebbles and stones; few medium dark concretions of iron and manganese oxide; slightly acid.

The thickness of the solum typically is 40 to 55 inches, but it ranges from 36 to more than 60 inches. A few pebbles and stones are throughout the profile.

The Ap horizon has chroma of 1 or 2. It ranges from 6 to 10 inches in thickness. It is loam, silt loam, or clay loam. The Bt horizon typically has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. The content of clay in the Bt horizon typically ranges from 32 to 35 percent, but in some pedons it is as much as 38 percent in thin layers in the upper part of the horizon.

The Gara soils in map units 179D3, 179E3, 179F3, and 993E3 are taxadjuncts to the series because they do not have the mollic colored epipedon that is definitive for the series. They have an A horizon that is yellowish brown (10YR 5/4) to strong brown (7.5YR 5/6). They classify as fine-loamy, mixed, mesic Typic Hapludalfs.

Garwin Series

The Garwin series consists of poorly drained, moderately permeable soils on broad divides and at the head of drainageways on uplands. 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; 2,420 feet north and 215 feet east of the center of sec. 9, T. 84 N., R. 15 W.

Ap—0 to 8 inches; black (N 2/0) silty clay loam (about 33 percent clay), very dark gray (10YR 3/1) dry; weak fine granular and moderate fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A1—8 to 15 inches; black (N 2/0) silty clay loam (about 33 percent clay), very dark gray (10YR 3/1) dry; moderate fine and very fine subangular blocky and moderate fine granular structure; friable; neutral; clear smooth boundary.

A2—15 to 23 inches; black (5Y 2/1) and very dark gray (5Y 3/1) silty clay loam (about 33 percent clay), very dark gray (10YR 3/1) dry; moderate fine subangular blocky and weak fine granular structure; firm; slightly acid; gradual smooth boundary.

Bg1—23 to 31 inches; dark gray (2.5Y 4/1) silty clay loam (about 35 percent clay); few distinct very dark gray (2.5Y 3/1) coatings on faces of peds; few fine distinct light olive brown (2.5Y 5/4) mottles; moderate fine angular and subangular blocky structure; firm; slightly acid; clear smooth boundary.

Bg2—31 to 44 inches; olive gray (5Y 5/2) silty clay loam (about 35 percent clay); few distinct dark gray (5Y 4/1) coatings on faces of peds; few fine faint light olive brown (2.5Y 5/4) mottles; weak fine prismatic structure parting to moderate fine angular blocky; firm; few fine dark concretions of iron and manganese oxide; neutral; gradual smooth boundary.

BCg—44 to 52 inches; olive gray (5Y 5/2) silty clay loam (about 29 percent clay); common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; friable; common fine dark concretions of iron and manganese oxide; large dark gray (10YR 4/1) krotovina at a depth of 43 to 47 inches; neutral; gradual smooth boundary.

Cg—52 to 60 inches; olive gray (5Y 5/2) silt loam (about 25 percent clay); common fine prominent strong brown (7.5YR 5/8) mottles; friable; few distinct very dark gray (10YR 3/1) clay coatings in root channels; few fine dark concretions of iron and manganese oxide; neutral.

The thickness of the solum ranges from 40 to 60 inches. Free carbonates are at a depth of 48 to 72 inches. The mollic epipedon typically is 20 to 24 inches thick but is as shallow as 18 inches in some pedons. The average content of clay in the control section is 30 to 35 percent; however, the content of clay may be as high as 39 percent in some of the horizons. The highest content of clay typically is in the lower part of the A horizon or the upper part of the B horizon.

The A horizon has hue of 10YR or 5Y or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. The Bg horizon has hue of 5Y or 2.5Y, value of 4 or 5, and chroma of 1 or 2. The Cg horizon typically is silt loam, but the range includes silty clay loam. The content of clay in the Cg horizon ranges from 24 to 29 percent.

Humeston Series

The Humeston series consists of very poorly drained, very slowly permeable soils in depressions on terraces. These soils formed in silty alluvium. The native vegetation is grasses and scattered trees. Slopes range from 0 to 2 percent.

Typical pedon of Humeston silt loam, 0 to 2 percent slopes, in an area of cropland; 2,800 feet west and 50

feet south of the northeast corner of sec. 9, T. 85 N., R. 16 W.

Ap—0 to 6 inches; black (10YR 2/1) silt loam (about 25 percent clay), very dark gray (10YR 3/1) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.
A—6 to 16 inches; very dark gray (10YR 3/1) silt loam (about 25 percent clay), dark gray (10YR 4/1) dry; weak very fine and fine granular structure; friable; neutral; clear smooth boundary.
E—16 to 28 inches; dark gray (10YR 4/1) silt loam (about 21 percent clay), gray (10YR 6/1) dry; few faint very dark gray (10YR 3/1) coatings on faces of peds; weak thin platy and weak fine subangular blocky structure; friable; few fine dark reddish brown (2.5YR 3/4) concretions; strongly acid; abrupt wavy boundary.
Bt1—28 to 40 inches; very dark gray (10YR 3/1) silty clay loam (about 38 percent clay); moderate fine prismatic structure parting to moderate fine subangular blocky; firm; many prominent black (N 2/0) clay coatings on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; few fine strong brown (7.5YR 5/6) concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.
Bt2—40 to 51 inches; very dark gray (10YR 3/1) silty clay (about 42 percent clay); many fine distinct olive (5Y 5/3) mottles; moderate fine prismatic structure parting to moderate medium subangular blocky; firm; many prominent black (N 2/0) clay coatings on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; few fine strong brown (7.5YR 5/6) concretions of iron and manganese oxide; medium acid; clear smooth boundary.
Bt3—51 to 60 inches; dark gray (10YR 4/1) silty clay (about 40 percent clay); common medium olive (5Y 5/3) mottles; weak fine prismatic structure; firm; few prominent black (N 2/0) clay coatings on faces of peds; common fine strong brown (7.5YR 4/6) concretions of iron and manganese oxide; slightly acid.

The solum typically is 48 to more than 60 inches thick. The upper part of the Bt horizon is the most acid part of the solum. It is strongly acid or very strongly acid. Carbonates are not within a depth of 6 feet.

The A or Ap horizon has value of 2 or 3. It is silt loam or silty clay loam. It has 24 to 30 percent clay. The E horizon has value of 4 or 5. The Bt horizon has hue of 10YR or is neutral in hue. It has value of 2 to 5 and chroma of 0 or 1. The Bt horizon is silty clay loam or silty clay. It has 35 to 48 percent clay.

Judson Series

The Judson series consists of well drained, moderately permeable soils on foot slopes and alluvial fans. These soils formed in local alluvium and colluvium. The native vegetation is tall prairie grasses. Slopes range from 2 to 5 percent.

Typical pedon of Judson silty clay loam, 2 to 5 percent slopes, in an area of cropland; 1,460 feet east and 1,000 feet north of the southwest corner of sec. 12, T. 85 N., R. 16 W.

Ap—0 to 7 inches; black (10YR 2/1) silty clay loam (27 percent clay), very dark grayish brown (10YR 3/2) dry; weak very fine and fine granular structure; friable; neutral; abrupt smooth boundary.
A1—7 to 16 inches; black (10YR 2/1) silty clay loam (29 percent clay), very dark gray (10YR 3/1) dry; weak fine granular structure; friable; slightly acid; clear smooth boundary.
A2—16 to 23 inches; very dark brown (10YR 2/2) silty clay loam (27 percent clay), very dark grayish brown (10YR 3/2) dry; few faint black (10YR 2/1) coatings on faces of peds; weak fine subangular blocky structure parting to moderate fine granular; friable; slightly acid; gradual smooth boundary.
A3—23 to 30 inches; very dark brown (10YR 2/2) silty clay loam (28 percent clay), very dark grayish brown (10YR 3/2) dry; few faint black (10YR 2/1) coatings on faces of peds; weak fine subangular blocky structure; friable; few faint light gray (10YR 7/2) silt coatings on faces of peds; slightly acid; gradual smooth boundary.
AB—30 to 36 inches; very dark grayish brown (10YR 3/2) silty clay loam (28 percent clay), brown (10YR 4/3) dry; weak fine and medium subangular blocky structure; friable; few faint light gray (10YR 7/2) silt coatings on faces of peds; medium acid; clear smooth boundary.
Bw—36 to 50 inches; brown (10YR 4/3) silty clay loam (29 percent clay); weak medium prismatic structure parting to weak medium subangular blocky; friable; few distinct dark brown (10YR 3/3) clay films on faces of peds; few faint light gray (10YR 7/2) silt coatings on faces of peds; medium acid; clear smooth boundary.
BC—50 to 60 inches; dark yellowish brown (10YR 4/4) silty clay loam (29 percent clay); weak medium prismatic structure parting to weak medium subangular blocky; friable; few distinct dark brown (10YR 3/3) clay films on faces of peds; few faint light gray (10YR 7/2) silt coatings on faces of peds; medium acid.

The thickness of the solum ranges from 45 to more

than 60 inches. The mollic epipedon ranges from 24 to 36 inches in thickness.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It has 25 to 32 percent clay. The B horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. It has 27 to 35 percent clay. Some pedons are mottled below a depth of 36 inches. The mottles have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6.

Kenyon Series

The Kenyon series consists of moderately well drained, moderately permeable soils on convex ridgetops and side slopes in the uplands. These soils formed in loamy surficial sediments overlying glacial till. The native vegetation is tall prairie grasses. Slopes range from 2 to 9 percent.

Typical pedon of Kenyon loam, 2 to 5 percent slopes, in an area of cropland; 2,600 feet west and 110 feet south of the northeast corner of sec. 1, T. 83 N., R. 13 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loam (about 21 percent clay), dark grayish brown (10YR 4/2) dry; weak fine granular and weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

BA—7 to 13 inches; dark brown (10YR 3/3) loam (about 21 percent clay), dark grayish brown (10YR 2/2) dry; common faint very dark grayish brown (10YR 3/2) coatings on faces of peds; weak fine and medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bw1—13 to 18 inches; dark yellowish brown (10YR 4/4) loam (about 21 percent clay); few faint dark brown (10YR 3/3) coatings on faces of peds; weak fine and medium subangular blocky structure; friable; a thin stone line in the lower part; medium acid; abrupt wavy boundary.

2Bw2—18 to 25 inches; yellowish brown (10YR 5/6) loam (about 25 percent clay); few faint dark yellowish brown (10YR 4/4) coatings on faces of peds; weak fine and medium subangular blocky structure; firm; medium acid; clear smooth boundary.

2Bw3—25 to 35 inches; yellowish brown (10YR 5/4) loam (about 25 percent clay); few faint dark yellowish brown (10YR 4/4) coatings on faces of peds; weak fine prismatic structure parting to weak medium subangular blocky; firm; few distinct light gray (10YR 7/1) silt coatings on faces of peds; medium acid; gradual smooth boundary.

2Bw4—35 to 46 inches; yellowish brown (10YR 5/4) loam (about 25 percent clay); few fine faint yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few distinct light gray (10YR 7/1) silt coatings on faces of peds; medium acid; gradual smooth boundary.

2BC—46 to 54 inches; yellowish brown (10YR 5/4) loam (about 25 percent clay); few fine faint yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak medium prismatic structure; firm; slightly acid; abrupt wavy boundary.

C—54 to 60 inches; yellowish brown (10YR 5/6) loam (about 25 percent clay); few medium distinct grayish brown (10YR 5/2) mottles; massive; firm; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 45 to 60 inches. The surficial sediments are loam, and the glacial till is loam, sandy clay loam, or clay loam.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Most pedons have a BA horizon, which has value of 3 or 4 and chroma of 3. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. Typically, a stone line separates the loamy surficial sediments from the firm glacial till.

The Kenyon soil in map unit 83C2 is a taxadjunct to the series because it does not have the mollic epipedon that is definitive for the series. It classifies as a fine-loamy, mixed, mesic Dystric Eutrocrept.

Keswick Series

The Keswick series consists of moderately well drained, slowly permeable soils on convex upland side slopes and nose slopes. These soils primarily formed in Late Sangamon paleosols that are derived from glacial till. The native vegetation is deciduous trees. Slopes range from 14 to 20 percent.

Typical pedon of Keswick silt loam, in an area of Lindley-Keswick complex, 14 to 18 percent slopes, moderately eroded; 600 feet west and 500 feet north of the center of sec. 21, T. 82 N., R. 15 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam (about 25 percent clay), grayish brown (10YR 5/2) dry; some streaks and pockets of brown (10YR 4/3) subsoil material; weak fine granular and weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

BE—6 to 11 inches; dark yellowish brown (10YR 4/4) silt loam (about 25 percent clay); some streaks and pockets of dark grayish brown (10YR 4/2) surface soil material; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bt1—11 to 18 inches; dark yellowish brown (10YR 4/4) silty clay loam (about 30 percent clay); few faint

brown (10YR 4/3) coatings on faces of peds; moderate fine and medium subangular blocky structure; friable; few faint clay films on faces of peds; medium acid; abrupt smooth boundary.

2Bt2—18 to 26 inches; strong brown (7.5YR 5/6) clay loam (about 38 percent clay); common fine and medium distinct yellowish red (5YR 4/6) and few medium distinct grayish brown (10YR 5/2) mottles; strong fine and medium angular blocky structure; firm; common distinct clay films on faces of peds; a weak stone line and a few pebbles in the upper part; strongly acid; gradual smooth boundary.

2Bt3—26 to 37 inches; strong brown (7.5YR 5/6) clay loam (about 38 percent clay); few fine distinct yellowish red (5YR 4/6) and grayish brown (10YR 5/2) mottles; weak fine prismatic structure parting to moderate medium angular blocky; firm; few distinct brown (7.5YR 4/4) clay films on faces of peds; strongly acid; gradual smooth boundary.

2BC—37 to 50 inches; strong brown (7.5YR 5/6) and grayish brown (10YR 5/2) clay loam (about 35 percent clay); weak medium prismatic structure; firm; few fine black and red concretions of iron and manganese oxide; medium acid; abrupt wavy boundary.

2C—50 to 60 inches; yellowish brown (10YR 5/6) clay loam (about 33 percent clay); few fine distinct grayish brown (10YR 5/2) and few fine faint strong brown (7.5YR 5/6) mottles; massive; firm; few soft accumulations of calcium carbonate; few fine black and red concretions of iron and manganese oxide; slight effervescence; mildly alkaline.

The thickness of the solum typically is more than 48 inches, but it ranges from 42 to 65 inches. The depth to carbonates commonly is the same as the thickness of the solum. A stone line is in the lower part of the A horizon or the upper part of the 2Bt horizon.

The A horizon has value of 3 or 4 and chroma of 1 or 2. It is 4 to 6 inches thick. It typically is silt loam, but the range includes loam. Depth to the Bt horizon ranges from 8 to 17 inches. The content of clay in the Bt horizon is highest at a depth of 10 to 20 inches. The 2Bt horizon is clay loam or clay. It has 35 to 48 percent clay. The upper part of the 2Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. If the matrix has hue of 7.5YR, the upper part of the horizon is mottled. The mottles have hue of 5YR or 2.5YR.

Killduff Series

The Killduff series consists of well drained and moderately well drained, moderately permeable soils on upland side slopes and in coves at the head of waterways. These soils formed in loess that is partly deoxidized and leached. The native vegetation is tall prairie grasses. Slopes range from 5 to 18 percent.

Typical pedon of Killduff silty clay loam, 9 to 14 percent slopes, moderately eroded, in an area of cropland; 800 feet west and 180 feet south of the northeast corner of sec. 19, T. 82 N., R. 16 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) silty clay loam (about 29 percent clay), brown (10YR 5/3) dry; some streaks and pockets of dark yellowish brown (10YR 4/4) subsurface material; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

Bw1—7 to 15 inches; dark yellowish brown (10YR 4/4) silty 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; slightly acid; clear smooth boundary.

Bw2—15 to 22 inches; dark yellowish brown (10YR 4/4) silty clay loam (about 29 percent clay); few fine distinct strong brown (7.5YR 5/6) mottles; few fine faint brown (10YR 5/3) mottles; weak medium prismatic structure parting to moderate medium subangular blocky structure; friable; few fine dark concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

Bw3—22 to 29 inches; dark yellowish brown (10YR 4/4) silty clay loam (about 29 percent clay); common fine distinct strong brown (7.5YR 5/6) mottles; few fine faint grayish brown (10YR 5/2) relict mottles; weak medium prismatic structure; friable; few fine dark concretions of iron and manganese oxide; neutral; clear smooth boundary.

BC—29 to 38 inches; yellowish brown (10YR 5/6) and grayish brown (2.5Y 5/2) silt loam (about 21 percent clay); weak coarse prismatic structure; friable; few fine dark concretions of iron and manganese oxide; neutral; gradual smooth boundary.

C—38 to 60 inches; grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) silt loam (about 21 percent clay); massive; friable; few fine dark concretions of iron and manganese oxide; neutral.

The thickness of the solum typically is 36 to 48 inches, but it ranges from 32 to 55 inches. Carbonates do not occur within a depth of 35 inches. The epipedon is less than 10 inches thick.

The A or Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It typically has mottles with chroma of 2 to 6 within a depth of 24 inches, but in some pedons these mottles do not occur above a depth of 30 inches. The gray mottles that are within a depth of 24 inches are considered relict. The

BC and C horizons are silty clay loam or silt loam.

Lamont Series

The Lamont series consists of well drained, moderately rapidly permeable soils on upland ridgetops and side slopes. These soils formed in moderately coarse textured and coarse textured eolian deposits. The native vegetation is deciduous trees. Slopes range from 5 to 25 percent.

Typical pedon of Lamont fine sandy loam, in an area of Downs-Lamont complex, 14 to 18 percent slopes, moderately eroded, used for crops; 600 feet west and 800 feet north of the southeast corner of sec. 21, T. 84 N., R. 16 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam (about 10 percent clay), pale brown (10YR 6/2) dry; some streaks and pockets of dark yellowish brown (10YR 4/4) subsoil material; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

BE—8 to 14 inches; dark yellowish brown (10YR 4/4) fine sandy loam (about 10 percent clay); few faint dark grayish brown (10YR 4/2) coatings on faces of peds; weak fine subangular blocky structure; very friable; slightly acid; clear smooth boundary.

Bt1—14 to 25 inches; yellowish brown (10YR 5/6) fine sandy loam (about 17 percent clay); weak fine and medium subangular blocky structure; very friable; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—25 to 33 inches; yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6) fine sandy loam (about 17 percent clay); weak fine and medium subangular blocky structure; very friable; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

BC—33 to 43 inches; brownish yellow (10YR 6/6) fine sandy loam (about 10 percent clay); single grain but some evidence of subangular blocky structure; loose, very friable; very few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

E&Bt—43 to 60 inches; brownish yellow (10YR 6/6) loamy fine sand (about 4 percent clay) (E); single grain; loose; 0.5- to 1-inch-thick lamellae of strong brown (7.5YR 5/6) fine sandy loam (Bt) at depths of 44 and 60 inches; strongly acid.

The thickness of the solum ranges from 30 to more than 60 inches. The Ap or A horizon generally has value of 3 or 4. In uneroded areas the E horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. In most cultivated areas it is incorporated into the Ap horizon. The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is fine sandy loam, sandy clay loam, or loam. It has 12 to 22 percent clay. The E&Bt horizon has value of 5 or 6. It contains 0.5- to 2.0-inch-thick lamellae (Bt part). The lamellae have hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 4 to 6.

Lawler Series

The Lawler series consists of somewhat poorly drained soils on alluvial terraces. These soils formed in loamy material underlain by sand and gravel. Permeability is moderate in the upper part of the profile and very rapid in the lower part. The native vegetation is tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Lawler loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes, in an area of cropland; 450 feet west and 30 feet south of the center of sec. 12, T. 82 N., R. 14 W.

Ap—0 to 7 inches; very dark brown (10YR 2/2) loam, very dark grayish brown (10YR 3/2) dry; weak fine granular and weak fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

AB—7 to 11 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; common faint dark grayish brown (10YR 2/2) coatings on faces of peds; few fine faint light olive brown (2.5Y 5/4) mottles; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bw1—11 to 21 inches; olive brown (2.5Y 4/4) loam; common fine distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

Bw2—21 to 30 inches; light olive brown (2.5Y 5/4) loam; few faint dark yellowish brown (2.5Y 4/4) coatings on faces of peds; few fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; few fine dark concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

BC—30 to 35 inches; yellowish brown (10YR 5/4) sandy loam; few fine faint brown (10YR 5/3) mottles; very weak fine subangular blocky structure; friable; medium acid; clear smooth boundary.

2C—35 to 60 inches; yellowish brown (10YR 5/4) sand; single grain; loose; slightly acid.

The depth to coarse textured material ranges from 24 to 40 inches. It generally is the same as the thickness of the solum.

The A horizon is loam or silt loam. It has a high

content of sand. It has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bw horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It generally has high-chroma and low-chroma mottles. The 2C horizon typically is sand but ranges from gravelly loamy sand to gravel.

Lawson Series

The Lawson series consists of somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. The native vegetation is tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Lawson silt loam, 0 to 2 percent slopes, in an area of cropland; 1,520 feet east and 420 feet north of the southwest corner of sec. 14, T. 82 N., R. 13 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silt loam (about 25 percent clay), very dark grayish brown (10YR 3/2) dry; weak fine granular and weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A1—7 to 18 inches; very dark gray (10YR 3/1) silt loam (about 25 percent clay), dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure; friable; neutral; gradual smooth boundary.

A2—18 to 27 inches; very dark grayish brown (10YR 3/2) silt loam (about 25 percent clay), dark gray (10YR 4/1) dry; common faint very dark gray (10YR 3/1) coatings on faces of peds; weak fine and medium subangular blocky structure; friable; neutral; gradual smooth boundary.

A3—27 to 35 inches; very dark grayish brown (10YR 3/2) silt loam (about 25 percent clay), dark grayish brown (10YR 4/2) dry; weak fine prismatic structure parting to weak medium subangular blocky; friable; few fine dark concretions of iron and manganese oxide; neutral; clear smooth boundary.

C1—35 to 44 inches; dark grayish brown (2.5Y 4/2) silt loam (about 25 percent clay); common fine distinct brown (7.5YR 4/4) mottles; weak fine prismatic structure; friable; few fine dark concretions of iron and manganese oxide; neutral; gradual smooth boundary.

C2—44 to 60 inches; dark grayish brown (2.5Y 4/2) silt loam (about 21 percent clay); many medium distinct brown (7.5YR 4/4) mottles; massive; friable; thin strata of sandy loam at depths of 48, 51, and 58 inches; few fine dark concretions of iron and manganese oxide; neutral.

The thickness of the solum ranges from about 30 to 48 inches. It is the same as the thickness of the A horizon.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It typically is silt loam, but the range includes silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It typically is silt loam that has thin strata of loam, sandy loam, or sand.

Lindley Series

The Lindley series consists of moderately well drained, moderately slowly permeable soils on convex upland side slopes and nose slopes. These soils formed in glacial till of Kansan and Nebraskan age. The native vegetation is deciduous trees. Slopes range from 14 to 40 percent.

Typical pedon of Lindley loam, 14 to 18 percent slopes, moderately eroded, in an area of cropland; 600 feet east and 200 feet north of the southwest corner of sec. 15, T. 82 N., R. 15 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam (about 25 percent clay), pale brown (10YR 6/3) dry; streaks and pockets of dark yellowish brown (10YR 4/4) clay loam from the subsurface layer; weak fine granular structure; friable; neutral; abrupt smooth boundary.

BE—6 to 10 inches; dark yellowish brown (10YR 4/4) clay loam (about 29 percent clay); few faint dark grayish brown (10YR 4/2) coatings on faces of peds; weak fine subangular blocky structure; firm; neutral; clear smooth boundary.

Bt1—10 to 15 inches; brown (7.5YR 4/4) clay loam (about 33 percent clay); few fine distinct grayish brown (10YR 5/2) mottles; moderate medium and fine subangular blocky structure; firm; few faint clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; slightly acid; gradual smooth boundary.

Bt2—15 to 25 inches; brown (7.5YR 4/4) clay loam (about 33 percent clay); few fine distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few faint clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; common fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Bt3—25 to 33 inches; strong brown (7.5YR 5/6) clay loam (about 33 percent clay); few fine distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure; firm; few distinct brown (7.5YR 4/4) clay films on faces of peds; few distinct light

gray (10YR 7/1) silt coatings on faces of peds; common fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

BC—33 to 42 inches; strong brown (7.5YR 5/6) clay loam (about 29 percent clay); common fine distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure; firm; few distinct brown (7.5YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; common fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

C—42 to 60 inches; yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) clay loam (about 29 percent clay); common fine distinct grayish brown (10YR 5/2) mottles; massive; firm; few fine dark concretions and stains of iron and manganese oxide; slightly acid.

The thickness of the solum ranges from 30 to 50 inches. Pebbles and stones generally are throughout the profile.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 to 4. In uncultivated areas the A horizon has value of 3 and chroma of 1 or 2. The A or Ap horizon is loam, or in eroded areas it is clay loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It typically is clay loam that has 30 to 35 percent clay.

Liscomb Series

The Liscomb series consists of well drained, moderately permeable soils on convex side slopes in the uplands. These soils formed in glacial till or loamy surficial sediments overlying glacial till. The native vegetation is tall prairie grasses. Slopes range from 5 to 18 percent.

The Liscomb soils in this county are taxadjuncts to the series because they do not have the mollic epipedon that is definitive for the series. They classify as fine-loamy, mixed, mesic Dystric Eutrocrepts.

Typical pedon of Liscomb loam, 5 to 9 percent slopes, moderately eroded, in an area of cropland; 2,440 feet east and 200 feet south of the northwest corner of sec. 11, T. 85 N., R. 16 W.

Ap—0 to 7 inches; very dark brown (10YR 2/2) loam (about 21 percent clay), very dark grayish brown (10YR 3/2) dry; some streaks and pockets of dark brown (10YR 3/3) subsurface material; weak fine granular and weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

AB—7 to 12 inches; dark brown (10YR 3/3) and brown (10YR 4/3) loam (about 21 percent clay), brown (10YR 4/3 and 5/3) dry; common distinct very dark brown (10YR 2/2) coatings on faces of peds; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

Bw1—12 to 19 inches; brown (10YR 4/3) loam (about 21 percent clay); weak fine subangular blocky structure; friable; few very dark grayish brown (10YR 3/2) wormcasts; slightly acid; clear smooth boundary.

Bw2—19 to 28 inches; dark yellowish brown (10YR 4/4) loam (about 25 percent clay); weak fine and medium subangular blocky structure; friable; slightly acid; gradual smooth boundary.

Bw3—28 to 38 inches; yellowish brown (10YR 5/4) loam (about 25 percent clay); few medium distinct grayish brown (2.5Y 5/2) and few fine distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine dark concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

BC—38 to 45 inches; yellowish brown (10YR 5/4) loam (about 25 percent clay); common medium prominent light brownish gray (2.5Y 6/2) and few fine faint yellowish brown (10YR 5/8) mottles; weak medium prismatic structure; friable; few fine dark concretions of iron and manganese oxide; neutral; gradual smooth boundary.

C—45 to 60 inches; yellowish brown (10YR 5/4) loam (about 25 percent clay); few coarse prominent light brownish gray (2.5Y 6/2) and few medium faint yellowish brown (10YR 5/8) mottles; massive; friable; few fine dark concretions of iron and manganese oxide; neutral.

The thickness of the solum ranges from 30 to 60 inches and commonly corresponds to the depth of calcium carbonates. The most acid part of the solum typically is the upper part of the Bw horizon.

The A or Ap horizon has a hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It typically is loam, but the range includes silt loam. The Bw horizon typically is loam, but the range includes sandy clay loam and clay loam. In some pedons the Bw horizon has thin layers of sandy loam. It has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. The BC and C horizons are firm or friable.

Muscatine Series

The Muscatine series consists of somewhat poorly drained, moderately permeable soils on broad, upland

ridgetops. 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; 2,320 feet west and 480 feet south of the northeast corner of sec. 16, T. 86 N., R. 16 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam (about 29 percent clay), very dark gray (10YR 3/1) dry; weak fine and very fine granular structure; friable; neutral; abrupt smooth boundary.

A—9 to 15 inches; very dark brown (10YR 2/2) silty clay loam (about 29 percent clay), very dark gray (10YR 3/1) dry; common faint black (10YR 2/1) coatings on faces of peds; weak fine granular structure; friable; slightly acid; gradual smooth boundary.

AB—15 to 22 inches; very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) silty clay loam (about 33 percent clay), dark grayish brown (10YR 4/2) dry; weak fine granular and weak fine subangular blocky structure; friable; medium acid; gradual smooth boundary.

Bg1—22 to 30 inches; dark grayish brown (10YR 4/2) silty clay loam (about 33 percent clay); few fine faint yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; few faint dark grayish brown (2.5Y 4/2) clay films on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Bg2—30 to 39 inches; dark grayish brown (2.5Y 4/2) silty clay loam (about 33 percent clay); common fine distinct and few medium distinct yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to weak fine subangular blocky; friable; few distinct very dark grayish brown (2.5Y 3/2) clay films on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

BCg—39 to 47 inches; grayish brown (2.5Y 5/2) silty clay loam (about 29 percent clay); common fine distinct yellowish brown (10YR 5/6) mottles; weak fine prismatic structure; friable; few fine dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

Cg—47 to 60 inches; grayish brown (2.5Y 5/2) silt loam (about 25 percent clay); common fine and medium strong brown (10YR 5/6) mottles; massive; friable; common fine tubular pores filled with organic material; few fine dark concretions of iron and manganese oxide; neutral.

The thickness of the solum ranges from 40 to 60 inches. Carbonates typically are at a depth of more than 60 inches, but in some pedons they are at a depth of 48 to 60 inches.

The A horizon has value of 2 and chroma of 1 or 2. It is silty clay loam. Most pedons have an AB or BA transitional layer. This layer has value of 3. It typically extends to a depth of 20 to 24 inches. The B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It has 30 to 35 percent clay. The content of clay is highest in the upper part of the B horizon. The BC and C horizons typically are silt loam or silty clay loam.

Nevin Series

The Nevin series consists of somewhat poorly drained, moderately permeable soils on low stream terraces. These soils formed in silty alluvium. The native vegetation is tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Nevin silty clay loam, 0 to 2 percent slopes, in an area of cropland; 1,260 feet south and 640 feet east of the northwest corner of sec. 16, T. 83 N., R. 16 W.

Ap—0 to 7 inches; black (10YR 2/1) silty clay loam (about 28 percent clay), very dark grayish brown (10YR 3/2) dry; weak fine granular and weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A1—7 to 14 inches; black (10YR 2/1) silty clay loam (about 28 percent clay), very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky and weak fine granular structure; friable; slightly acid; clear smooth boundary.

A2—14 to 22 inches; very dark brown (10YR 2/2) silty clay loam (about 28 percent clay), very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bt1—22 to 30 inches; dark grayish brown (10YR 4/2) silty clay loam (about 34 percent clay); few fine distinct strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; friable; few faint clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—30 to 37 inches; dark grayish brown (10YR 4/2) silty clay loam (about 34 percent clay); common fine distinct strong brown (7.5YR 5/6) mottles; weak fine prismatic structure parting to moderate fine and medium subangular blocky; friable; few faint clay films on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Bt3—37 to 46 inches; grayish brown (10YR 5/2) silty clay loam (about 34 percent clay); common fine

distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few faint clay films on faces of peds; few fine dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

C—46 to 60 inches; grayish brown (10YR 5/2) silty clay loam (about 28 percent clay); many fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; common fine tubular pores filled with dark organic material; few medium dark concretions of iron and manganese oxide; 1-inch-thick sand lens at a depth of 57 inches; neutral.

The thickness of the solum typically is more than 40 inches, but it ranges from 36 to 60 inches. The content of sand in the solum ranges from 10 to 15 percent.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is silt loam or silty clay loam. It has 26 to 30 percent clay. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2. It typically has mottles that have hue of 7.5YR, 10YR, or 2.5Y. The mottles are higher in value and chroma than the matrix. The Bt horizon is silty clay loam that has 30 to 35 percent clay. The ratio of clay in the B horizon typically is about 1.25 times the ratio of clay in the A horizon.

Nodaway Series

The Nodaway series consists of moderately well drained, moderately permeable soils on flood plains. These soils formed in stratified silty alluvium. The native vegetation is mixed trees and tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Nodaway silt loam, 0 to 2 percent slopes, in a cultivated field; 940 feet west and 200 feet north of the center of sec. 9, T. 83 N., R. 16 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure and some platiness because of stratification during deposition; friable; neutral; abrupt smooth boundary.

C1—7 to 31 inches; dark grayish brown (10YR 4/2), very dark grayish brown (10YR 3/2), and grayish brown (10YR 5/2) silt loam; massive with some platiness because of stratification during deposition; friable; neutral; gradual smooth boundary.

C2—31 to 54 inches; grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) silt loam; few fine distinct strong brown (7.5YR 5/6) mottles; few thin very dark grayish brown (10YR 3/2) strata and coatings in wormholes; massive with some platiness because of stratification during deposition; friable; slightly acid; abrupt wavy boundary.

Ab—54 to 60 inches; black (10YR 2/1) silt loam; few fine distinct strong brown (7.5YR 5/6) mottles; weak fine granular structure; friable; slightly acid.

The Ap horizon typically has value of 3 and chroma of 1 or 2. In some pedons it has thin strata with hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The colors in the C horizon typically are stratified. They have hue of 10YR, value of 3 to 5, and chroma of 1 to 4. The A and C horizons typically are silt loam, but the range includes silty clay loam. The A and C horizons have a clay content of 20 to 28 percent. Some pedons have thin lenses of fine sand or coarser textured material above a depth of 40 inches. The Ab horizon typically is at a depth of 50 inches or more, but in some pedons it is at a depth of 36 to 50 inches.

Sawmill Series

The Sawmill series consists of poorly drained, moderately permeable soils in upland waterways. These soils formed in silty alluvium. The native vegetation is water-tolerant grasses. Slopes range from 1 to 4 percent.

Typical pedon of Sawmill silty clay loam, 1 to 4 percent slopes, in an area of cropland; 2,640 feet east and 80 feet north of the southwest corner of sec. 16, T. 86 N., R. 16 W.

Ap—0 to 7 inches; black (N 2/0) silty clay loam (about 29 percent clay), very dark gray (10YR 3/1) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A1—7 to 16 inches; black (N 2/0) silty clay loam (about 29 percent clay), very dark brown (10YR 2/2) dry; weak fine granular and moderate fine and medium subangular blocky structure; friable; neutral; gradual smooth boundary.

A2—16 to 28 inches; black (N 2/0) silty clay loam (about 29 percent clay), black (N 2/0) dry; weak fine granular and weak fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

A3—28 to 34 inches; very dark gray (5Y 3/1) silty clay loam (about 33 percent clay), dark gray (10YR 4/1) dry; few fine faint olive brown (2.5Y 4/4) mottles; weak fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

Bg1—34 to 41 inches; dark gray (5Y 4/1) silty clay loam (about 33 percent clay); few fine distinct yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to weak fine subangular blocky; friable; neutral; clear smooth boundary.

Bg2—41 to 47 inches; dark gray (5Y 4/1) silty clay loam (about 33 percent clay); many fine distinct yellowish brown (10YR 5/6) mottles; weak fine prismatic

structure; friable; few faint very dark gray (10YR 3/1) clay coatings on faces of peds; neutral; clear smooth boundary.

Cg—47 to 60 inches; olive gray (5Y 5/2) and yellowish brown (10YR 5/6) silty clay loam (about 29 percent clay); massive with some vertical cleavage; friable; few distinct very dark gray (10YR 3/1) clay coatings on cleavage planes; neutral.

The thickness of the solum ranges from 36 to 60 inches. The thickness of the mollic epipedon ranges from 24 to 36 inches.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 and chroma of 0 to 2. The Bg horizon has hue of 5Y or 2.5Y, value of 3 to 5, and chroma of 1 or 2. In most pedons it has distinct mottles with hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 3 to 8. The content of clay in the Bg horizon is 30 to 35 percent.

Shelby Series

The Shelby series consists of moderately well drained, moderately slowly permeable soils on convex upland side slopes. These soils formed in glacial till. The native vegetation is tall prairie grasses. Slopes range from 9 to 18 percent.

The Shelby soils in this county are taxadjuncts to the series because they do not have the mollic epipedon that is definitive for the Shelby series. They classify as fine-loamy, mixed, mesic, Mollic Hapludalfs.

Typical pedon of Shelby loam, 9 to 14 percent slopes, moderately eroded, in a cultivated field; 1,600 feet east and 1,100 feet south of the northwest corner of sec. 20, T. 82 N., R. 16 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) loam (about 26 percent clay), grayish brown (10YR 4/2) dry; streaks and pockets of dark yellowish brown (10YR 4/4) subsoil material; weak fine granular structure; friable; medium acid; abrupt smooth boundary.

BA—8 to 18 inches; dark yellowish brown (10YR 4/4) clay loam (about 27 percent clay); weak fine prismatic structure parting to weak fine subangular blocky; firm; common distinct brown (7.5YR 4/4) clay coatings on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid; clear smooth boundary.

Bt1—18 to 31 inches; yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) clay loam (about 34 percent clay); weak fine prismatic structure parting to weak medium subangular blocky; firm; common distinct brown (7.5YR 4/4) clay coatings on faces of peds; few fine dark concretions of iron and manganese oxide; about 2 or 3 percent glacial pebbles and stones; medium acid; gradual smooth boundary.

Bt2—31 to 42 inches; yellowish brown (10YR 5/4) clay loam (about 34 percent clay); common medium distinct strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure; firm; few distinct brown (7.5YR 4/4) clay coatings on faces of peds; few fine dark concretions of iron and manganese oxide; about 2 or 3 percent glacial pebbles and stones; medium acid; gradual smooth boundary.

C1—42 to 49 inches; yellowish brown (10YR 5/4) clay loam (about 29 percent clay); few fine faint yellowish brown (10YR 5/6) mottles; massive; firm; very few distinct brown (7.5YR 4/4) clay coatings on faces of cleavage planes; few fine dark concretions of iron and manganese oxide; about 2 or 3 percent glacial pebbles and stones; slightly acid; abrupt wavy boundary.

C2—49 to 60 inches; yellowish brown (10YR 5/4) clay loam (about 29 percent clay); few fine faint yellowish brown (10YR 5/6) mottles; massive; firm; few fine dark concretions of iron and manganese oxide; few fine and medium soft accumulations of calcium carbonate; about 2 or 3 percent glacial pebbles and stones; slight effervescence; mildly alkaline.

The thickness of the solum typically is 40 to 60 inches, but it ranges from 36 to 72 inches. A few pebbles and stones are throughout the profile. The content of clay ranges from 25 to 35 percent throughout the solum.

The Ap horizon has value of 2 or 3 and chroma of 2. It is loam or clay loam. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. The depth to free carbonates commonly is 40 to 60 inches, but it ranges from 30 to more than 60 inches.

Sperry Series

The Sperry series consists of very poorly drained, slowly permeable soils in slight depressions on uplands. These soils formed in loess. The native vegetation is water-tolerant grasses and sedges. Slopes are 0 to 1 percent.

Typical pedon of Sperry silt loam, 0 to 1 percent slopes, in an area of cropland; 1,840 feet south and 280 feet east of the northwest corner of sec. 9, T. 84 N., R. 16 W.

Ap—0 to 7 inches; black (10YR 2/1) silt loam (about 21 percent clay), dark gray (10YR 4/1) dry; weak fine granular structure; neutral; abrupt smooth boundary.

E—7 to 13 inches; gray (10YR 5/1) silt loam (about 21

percent clay), light gray (10YR 6/1) dry; few distinct black (10YR 2/1) coatings on faces of peds; few fine distinct yellowish brown (10YR 5/6) mottles; moderate thin platy structure; friable; neutral; abrupt wavy boundary.

BE—13 to 16 inches; very dark gray (10YR 3/1) silty clay loam (about 33 percent clay); strong fine angular blocky structure; friable; common distinct light gray (10YR 7/1) silt coatings on faces of peds; slightly acid; clear smooth boundary.

Btg1—16 to 23 inches; dark gray (10YR 4/1) and very dark gray (10YR 3/1) silty clay (about 42 percent clay); few fine distinct light olive brown (2.5Y 5/4) mottles; weak fine prismatic structure parting to moderate fine subangular blocky; firm; common faint very dark gray (10YR 3/1) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; medium acid; clear smooth boundary.

Btg2—23 to 32 inches; dark gray (5Y 4/1) silty clay (about 42 percent clay); common fine distinct light olive brown (2.5Y 5/4) and few fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; common faint very dark gray (10YR 3/1) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; medium acid; gradual smooth boundary.

Btg3—32 to 40 inches; gray (5Y 5/1) silty clay loam (about 38 percent clay); common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common faint dark gray (5Y 4/1) clay films on faces of peds; few fine black concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

Btg4—40 to 46 inches; gray (5Y 5/1) silty clay loam (about 38 percent clay); many fine prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few faint dark gray (5Y 4/1) clay films on faces of peds; few fine black concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

Cg—46 to 60 inches; olive gray (5Y 5/2) silty clay loam (about 29 percent clay); common few and medium strong brown (7.5YR 5/6) mottles; massive; friable; few fine black concretions of iron and manganese oxide; slightly acid.

The thickness of the solum ranges from 40 to more than 60 inches. The mollic epipedon is 10 to 16 inches thick. In most pedons it is interrupted by an E horizon that is not mollic.

The A or Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1. It typically is silt loam, but the range includes silty clay loam. The E horizon typically has hue of 10YR, value of 4 or 5, and chroma of 1. The Btg horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 1. It averages about 38 to 45 percent clay.

Spillville Series

The Spillville series consists of somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in loamy alluvium. The native vegetation is prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Spillville loam, 0 to 2 percent slopes, in an area of cropland; 610 feet north and 380 feet east of the southwest corner of sec. 9, T. 83 N., R. 16 W.

Ap—0 to 7 inches; black (10YR 2/1) loam (about 21 percent clay), very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A1—7 to 23 inches; very dark brown (10YR 2/2) loam (about 21 percent clay), very dark grayish brown (10YR 3/2) dry; few faint black (10YR 2/1) coatings on faces of peds; weak fine granular structure; friable; neutral; gradual smooth boundary.

A2—23 to 34 inches; very dark grayish brown (10YR 3/2) loam (about 21 percent clay), dark grayish brown (10YR 4/2) dry; few distinct black (10YR 2/1) coatings on faces of peds; weak fine granular structure; neutral; clear smooth boundary.

A3—34 to 45 inches; very dark grayish brown (10YR 3/2) loam (about 21 percent clay), dark grayish brown (10YR 4/2) dry; few fine faint yellowish brown (10YR 5/6) mottles; very weak fine subangular blocky structure; friable; few fine dark concretions of iron and manganese oxide; neutral; gradual smooth boundary.

C—45 to 60 inches; dark grayish brown (10YR 4/2) loam (about 21 percent clay); common fine distinct yellowish brown (10YR 5/6) and few fine faint grayish brown (2.5Y 5/2) mottles; massive; friable; few fine dark concretions of iron and manganese oxide; neutral.

The thickness of the solum typically is about 45 inches, but it ranges from 30 to 55 inches. Carbonates are not within a depth of 60 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It typically is more than 40 inches thick, but it ranges from 30 to 50 inches in thickness. It typically is loam, but the range includes silt loam that has a high content of sand. Mottles in the C horizon

commonly have hue of 10YR, but some have hue of 2.5Y and chroma of 1 or 2. The C horizon typically is loam, but in some pedons it has strata of sandy loam or loamy sand.

Tama Series

The Tama series consists of well drained, moderately permeable soils on convex ridgetops and side slopes. These soils formed in loess. The native vegetation is tall prairie grasses. Slopes range from 0 to 18 percent.

Typical pedon of Tama silty clay loam, 2 to 5 percent slopes, in an area of cropland; 760 feet east and 186 feet north of the southwest corner of sec. 28, T. 86 N., R. 16 W.

Ap—0 to 6 inches; very dark brown (10YR 2/2) silty clay loam (28 percent clay), very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; strongly acid; abrupt smooth boundary.

A1—6 to 10 inches; very dark brown (10YR 2/2) silty clay loam (32 percent clay), very dark grayish brown (10YR 3/2) dry; moderate medium granular structure; friable; strongly acid; gradual smooth boundary.

A2—10 to 14 inches; very dark brown (10YR 2/2) silty clay loam (32 percent clay), dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; strongly acid; gradual smooth boundary.

BA—14 to 18 inches; very dark grayish brown (10YR 3/2) and brown (10YR 4/3) silty clay loam (34 percent clay); brown (10YR 4/3) when kneaded; moderate fine subangular blocky structure; friable; few distinct gray (10YR 6/1) silt coatings on faces of peds; many roots; common earthworm casts and holes; strongly acid; gradual smooth boundary.

Bt—18 to 32 inches; brown (10YR 4/3) silty clay loam (34 percent clay); dark yellowish brown (10YR 4/4) when kneaded; moderate fine subangular blocky structure; friable; few faint clay films on faces of peds; few distinct gray (10YR 6/1) silt coatings on faces of peds; many fine roots; common earthworm casts and holes; strongly acid; gradual smooth boundary.

BC—32 to 45 inches; dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) silty clay loam (32 percent clay); few fine faint brown (10YR 5/3) and yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few faint clay films on faces of peds; few distinct gray (10YR 6/1) silt coatings on faces of peds; many fine roots; many fine pores; strongly acid; gradual smooth boundary.

C—45 to 60 inches; yellowish brown (10YR 5/4) silty clay loam (28 percent clay); many fine distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; massive with some vertical cleavage planes; friable; few distinct gray (10YR 6/1) silt coatings on vertical cleavage planes; medium acid.

The thickness of the solum ranges from 36 to more than 60 inches. Carbonates are not within a depth of 60 inches.

The A or Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It typically is silty clay loam, but the range includes silt loam. It has 25 to 32 percent clay. The B horizon has hue of 10YR, value of 3 to 5, and chroma of 3 to 6. It is silty clay loam that has 27 to 35 percent clay.

The Tama soils in map units 120B2, 120C2, 120C3, 120D2, and 120D3 are taxadjuncts to the series because they do not have the mollic epipedon that is definitive for the series. They have an A horizon that is 3 to 9 inches thick. They classify as fine-silty, mixed, mesic Mollic Hapludalfs.

Timula Series

The Timula series consists of well drained, moderately permeable soils on upland ridgetops and side slopes. These soils formed in loess. The native vegetation is deciduous trees. Slopes range from 14 to 25 percent.

Typical pedon of Timula silt loam, 14 to 18 percent slopes, moderately eroded, in a pastured area; 380 feet north and 60 feet west of the center of sec. 28, T. 86 N., R. 15 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam (about 21 percent clay), light brownish gray (10YR 6/2) dry; some streaks and pockets of yellowish brown (10YR 5/4) subsoil material; few faint very dark grayish brown (10YR 3/2) coatings on faces of peds; weak fine subangular blocky structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bw—6 to 15 inches; yellowish brown (10YR 5/4) silt loam (about 20 percent clay); weak fine and medium subangular blocky structure; friable; common fine roots; neutral; clear smooth boundary.

BC—15 to 22 inches; yellowish brown (10YR 5/4) and grayish brown (2.5Y 5/2) silt loam (about 16 percent clay); weak medium subangular blocky structure; friable; common fine roots; few medium strong brown (7.5YR 5/8) concretions of iron and manganese oxide; neutral; clear smooth boundary.

C1—22 to 35 inches; light brownish gray (2.5Y 6/2) silt loam (about 16 percent clay); few medium distinct

yellowish brown (10YR 5/6) mottles; massive with some vertical cleavage planes; friable; few fine roots; few coarse strong brown (7.5YR 5/8) concretions and pipestems of iron and manganese oxide; neutral; clear smooth boundary.

C2—35 to 60 inches; light brownish gray (2.5Y 6/2) silt loam (about 16 percent clay); few medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; few fine roots; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 20 to 45 inches. These soils developed in a deoxidized zone or in a thin, mottled, deoxidized weathering zone. Carbonates are at a depth of 24 to 40 inches.

The Ap horizon has value of 4 and chroma of 2 or 3. The Bw and BC horizons have hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 8. The content of clay is highest near the surface. The content of clay in the Ap horizon and the BE horizon, if it occurs, ranges from 18 to 26 percent. The content of clay in the Bw, BC, and C horizons ranges from 10 to 18 percent.

Traer Series

The Traer series consists of poorly drained, slowly permeable soils on broad upland ridgetops. These soils formed in loess. The native vegetation is deciduous trees. Slopes range from 0 to 2 percent.

Typical pedon of Traer silt loam, 0 to 2 percent slopes, in an area of cropland; 600 feet east and 1,120 feet south of the center of sec. 18, T. 83 N., R. 15 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam (18 percent clay), light gray (10YR 6/1) and light brownish gray (10YR 6/2) dry; moderate medium and fine granular structure; friable; few distinct very dark gray (10YR 3/1) organic coatings on faces of peds; few fine black (10YR 2/1) concretions of iron and manganese oxide; slightly acid; abrupt smooth boundary.

E—7 to 10 inches; grayish brown (10YR 5/2) silt loam (26 percent clay), light brownish gray (10YR 6/2) dry; weak thin platy structure parting to weak fine granular; friable; few fine black (10YR 2/1) concretions of iron and manganese oxide; very strongly acid; clear smooth boundary.

BE—10 to 13 inches; dark grayish brown (2.5Y 4/2) silty clay loam (31 percent clay); few fine distinct light yellowish brown (10YR 6/4) mottles; moderate fine angular blocky structure; friable; few distinct very dark gray (10YR 3/1) organic coatings; many distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; few fine black (10YR 2/1) concretions of iron and manganese oxide; very strongly acid; clear smooth boundary.

Btg1—13 to 19 inches; dark grayish brown (2.5Y 4/2) silty clay loam (39 percent clay); strong medium angular blocky structure; firm; common distinct very dark grayish brown (2.5Y 3/2) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; few fine black (10YR 2/1) concretions of iron and manganese oxide; very strongly acid; clear smooth boundary.

Btg2—19 to 23 inches; mottled dark grayish brown (2.5Y 4/2) and light olive brown (2.5Y 5/4) silty clay loam (40 percent clay); strong medium angular blocky structure; firm; common distinct dark olive gray (5Y 3/2) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; few fine black (10YR 2/1) concretions of iron and manganese oxide; very strongly acid; gradual smooth boundary.

Btg3—23 to 29 inches; mottled dark grayish brown (2.5Y 4/2), olive gray (5Y 4/2), and yellowish brown (10YR 5/6) silty clay loam (36 percent clay); weak coarse prismatic structure parting to moderate medium angular blocky; friable; few distinct dark olive gray (5Y 3/2) clay films on faces of peds; few fine dark reddish brown (5YR 3/2) stains of iron oxide; very strongly acid; gradual smooth boundary.

Btg4—29 to 41 inches; mottled grayish brown (2.5Y 5/2), olive (5Y 5/3), and yellowish brown (10YR 5/6) silty clay loam (34 percent clay); weak coarse prismatic structure parting to moderate coarse angular blocky; friable; few distinct dark olive gray (5Y 3/2) clay films on faces of peds; few fine dark reddish brown (5YR 3/2) stains of iron oxide; very strongly acid; gradual smooth boundary.

BCg—41 to 50 inches; mottled light olive gray (5Y 6/2) and yellowish brown (10YR 5/6) silty clay loam (29 percent clay); very weak coarse prismatic structure; friable; few lime concretions in the lower part; mildly alkaline; gradual smooth boundary.

Cg—50 to 60 inches; mottled light olive gray (5Y 6/2) and yellowish brown (10YR 5/6) silt loam (24 percent clay); massive; friable; slight effervescence; mildly alkaline.

The thickness of the solum ranges from about 40 to 70 inches. The depth to carbonates ranges from about 40 to more than 70 inches. The most acid part of the solum is strongly acid or very strongly acid.

The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2. The A horizon in undisturbed or noncultivated areas is 2 to 5 inches thick. It has hue of 10YR, value of 3, and chroma of 1 or 2. The E horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. The A and E horizons typically average between 18 and

26 percent clay. The Btg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2. The content of clay in the upper 20 inches of the argillic horizon commonly ranges from 36 to 40 percent. The ratio of clay in the B horizon typically is 1.5 times the ratio of clay in the A horizon. The Cg horizon has hue of 5Y, 2.5Y, or 10YR, value of 5 or 6, and chroma of 2 to 6. It is silt loam that contains about 22 to 27 percent clay.

Waubeek Series

The Waubeek series consists of well drained, moderately permeable soils on upland side slopes and ridgetops. These soils formed in about 20 to 40 inches of loess and the underlying glacial till. The native vegetation is mixed prairie grasses and deciduous trees. Slopes range from 2 to 9 percent.

Typical pedon of Waubeek silt loam, 5 to 9 percent slopes; 2,100 feet west and 80 feet north of the southeast corner of sec. 24, T. 84 N., R. 6 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam (about 21 percent clay), brown (10YR 5/3) dry; weak fine granular and weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

E—7 to 10 inches; brown (10YR 4/3) silt loam (about 21 percent clay), pale brown (10YR 6/3) dry; few faint dark brown (10YR 3/3) coatings on faces of peds; weak thin platy structure; friable; slightly acid; clear smooth boundary.

Bt1—10 to 14 inches; brown (10YR 4/3) silty clay loam (about 30 percent clay); moderate fine subangular blocky structure; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—14 to 23 inches; yellowish brown (10YR 5/4) silty clay loam (about 30 percent clay); moderate fine and medium subangular blocky structure; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; slightly acid; gradual smooth boundary.

Bt3—23 to 33 inches; yellowish brown (10YR 5/4) silty clay loam (about 28 percent clay); weak fine prismatic structure parting to moderate medium and fine subangular blocky; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; slightly acid; gradual smooth boundary.

Bt4—33 to 38 inches; yellowish brown (10YR 5/4) silty clay loam (about 28 percent clay); weak fine prismatic structure parting to weak medium subangular blocky; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; slightly acid; abrupt wavy boundary.

2BC—38 to 50 inches; strong brown (7.5YR 5/6) loam (about 25 percent clay); weak medium prismatic structure; firm; few faint brown (7.5YR 4/4) clay films on faces of peds; 1- to 2-inch layer of sandy loam and a stone line of small pebbles in the upper part; neutral; clear smooth boundary.

2C—50 to 60 inches; yellowish brown (10YR 5/6) loam (about 25 percent clay); massive; firm; neutral.

The thickness of the solum ranges from about 42 to 60 inches. The thickness of the loess deposit typically is 24 to 40 inches, but it ranges from 20 to 40 inches.

The Ap horizon has value of 2 or 3 and chroma of 2. The E horizon has chroma of 2 or 3. In some cultivated areas it is incorporated into the Ap horizon. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam or silty clay loam. It has 25 to 32 percent clay. The 2BC and 2C horizons generally are loam, but the range includes sandy clay loam. Typically, the upper part of the 2BC horizon contains a stone line.

The Waubeek soils in map units 771C2 and 771D2 are taxadjuncts to the series because they do not have the mollic epipedon that is definitive for the series. They classify as fine-silty, mixed, mesic Typic Hapludalfs.

Waukegan Series

The Waukegan series consists of well drained soils. These soils formed in silty alluvium and the underlying sand and gravel. 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 9 percent.

Typical pedon of Waukegan silt loam, 5 to 9 percent slopes, in an area of cropland; 1,350 feet west and 2,400 feet south of the northeast corner of sec. 25, T. 85 N., R. 15 W.

Ap—0 to 7 inches; very dark brown (10YR 2/2) silt loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A—7 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 4/3) dry; some streaks and pockets of very dark brown (10YR 3/1) surface material; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

BA—12 to 20 inches; brown (10YR 4/3) and dark brown (10YR 3/3) silt loam that has a high content of sand; weak fine subangular blocky structure; friable; medium acid; clear smooth boundary.

Bw1—20 to 27 inches; dark yellowish brown (10YR 4/4) silt loam that has a high content of sand; weak fine and medium subangular blocky structure; friable; few distinct brownish gray (10YR 6/2) silt coatings on faces of peds; few dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

Bw2—27 to 35 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

2C1—35 to 47 inches; yellowish brown (10YR 5/6) loamy sand; single grain; loose; slightly acid; gradual smooth boundary.

2C2—47 to 60 inches; yellowish brown (10YR 5/6 and 5/8) loamy sand; single grain; loose; clay coatings on sand grains; about 10 to 15 percent gravel; neutral.

The thickness of the solum ranges from 30 to 50 inches. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silt loam that has 18 to 27 percent clay. The upper part of the Bw horizon has hue of 10YR and value and chroma of 3 to 5. The lower part has hue of 10YR or 2.5Y and value and chroma of 3 to 5. The 2C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 to 6.

Wiota Series

The Wiota series consists of well drained, moderately permeable soils on stream terraces. These soils formed in silty alluvium. The native vegetation is prairie grasses. Slopes range from 0 to 5 percent.

Typical pedon of Wiota silt loam, 0 to 2 percent slopes, in an area of cropland; 1,560 feet south and 50 feet east of the northwest corner of sec. 10, T. 85 N., R. 16 W.

Ap—0 to 7 inches; very dark brown (10YR 2/2) silt loam (about 25 percent clay), very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A—7 to 18 inches; very dark brown (10YR 2/2) silt loam (about 25 percent clay), dark grayish brown (10YR 4/2) dry; weak fine granular and weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

BA—18 to 23 inches; dark brown (10YR 3/3) silty clay loam (about 33 percent clay), brown (10YR 4/3) dry; few faint very dark grayish brown (10YR 3/2) coatings on faces of peds; weak fine subangular blocky structure; friable; few distinct light gray (10YR 7/1) silt coatings on faces of peds; slightly acid; clear smooth boundary.

Bt1—23 to 34 inches; brown (10YR 4/3) silty clay loam (about 33 percent clay); weak fine and medium subangular blocky structure; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt2—34 to 41 inches; dark yellowish brown (10YR 4/4) and brown (10YR 4/3) silty clay loam (about 33 percent clay); weak fine prismatic structure parting to moderate medium subangular blocky; friable; few distinct brown (7.5YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; medium acid; clear smooth boundary.

BCt—41 to 49 inches; yellowish brown (10YR 5/4) silty clay loam (about 33 percent clay); few fine faint yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few distinct brown (7.5YR 4/4) clay films on faces of peds; few distinct light gray (10YR 7/1) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid; clear smooth boundary.

C—49 to 60 inches; brown (10YR 5/3) silt loam (about 25 percent clay); many medium distinct strong brown (7.5YR 4/6) mottles; massive; friable; many tubular pores; common fine dark concretions of iron and manganese oxide; medium acid.

The thickness of the solum ranges from 36 to 60 inches. The mollic epipedon ranges from 18 to 32 inches in thickness. It includes the upper part of the B horizon in most pedons. Carbonates are not within a depth of 60 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Typically, it is silt loam, but the range includes silty clay loam. The Bt horizon typically has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. In some pedons it is dark brown (10YR 3/3) in the upper part. It is slightly acid to strongly acid. The content of clay in the Bt horizon ranges from 32 to 36 percent. The C horizon typically is silt loam. In some pedons it is silty clay loam, and in other pedons it is stratified and includes loam, sandy loam, loamy sand, and sand.

Zook Series

The Zook series consists of poorly drained, slowly permeable soils on flood plains. These soils formed in silty alluvium that has less than 15 percent sand. The native vegetation is water-tolerant grasses. Slopes range from 0 to 2 percent.

Typical pedon of Zook silty clay, 0 to 2 percent slopes, in an area of cropland; 840 feet west and 160 feet north of the center of sec. 3, T. 82 N., R. 15 W.

Ap—0 to 7 inches; black (N 2/0) silty clay (43 percent clay), black (10YR 2/1) dry; weak fine granular and weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

A1—7 to 19 inches; black (N 2/0) silty clay (43 percent clay), black (10YR 2/1) dry; weak fine granular structure; friable; slightly acid; gradual smooth boundary.

A2—19 to 27 inches; black (N 2/0) silty clay (43 percent clay), very dark gray (10YR 3/1) dry; weak fine granular and weak fine and medium subangular blocky structure; friable; few faint clay coatings on faces of peds; medium acid; gradual smooth boundary.

A3—27 to 32 inches; black (5Y 2/1) and very dark gray (5Y 3/1) silty clay (41 percent clay), very dark gray (10YR 3/1) dry; moderate medium and fine subangular blocky structure; firm; many faint continuous clay coatings on faces of peds; medium acid; clear smooth boundary.

Bg1—32 to 39 inches; very dark gray (5Y 3/1) silty clay (41 percent clay); few faint black (10YR 2/1) coatings on faces of peds; few fine distinct light olive brown (2.5Y 5/4) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; many distinct clay coatings on faces of peds; medium acid; clear smooth boundary.

Bg2—39 to 47 inches; dark gray (5Y 4/1) silty clay loam (39 percent clay); few fine distinct light olive brown (2.5Y 5/4) mottles; weak medium prismatic structure; firm; few distinct clay coatings on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Cg—47 to 60 inches; gray (5Y 5/1) silty clay loam (39 percent clay); few fine distinct light olive brown (2.5Y 5/4) mottles; massive with some vertical cleavage planes in the upper part; firm; few fine dark concretions of iron and manganese oxide; medium acid.

The solum is 36 to 60 inches thick. It typically is silty clay. The content of clay ranges from 38 to 44 percent in the upper 16 inches and from 39 to 45 percent below a depth of 16 inches.

The A horizon ranges from 30 to 40 inches in thickness. It has hue of 10YR or is neutral in hue. It has value of 2 and chroma of 0 or 1. The Bg and Cg horizons have hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2.

Formation of the Soils

This section describes the factors of soil formation and relates these factors to the soils in Tama County. It also describes the processes that result in the formation of soil horizons. Detailed descriptions of profiles that are considered to be representative of the series are in the section "Soil Series and Their Morphology."

Factors of Soil Formation

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 the soil material *(5)*. Human activities also affect soil formation.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of parent material into a soil. The length of time may be short or long, but some time is required for differentiation of soil horizons. A long period generally is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four.

Parent Material

The accumulation of parent material is the first step in the development of a soil. Most of the soils in the county 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, alluvium, glacial drift, and sandy eolian material.

Loess, a silty material deposited by wind, covers about 83 percent of the county. It ranges in depth from about 15 to 20 feet on the more stable ridgetops south of the Iowa River to about 4 to 8 feet on the ridgetops of the Iowan erosional surface in the northern half of the county. In most areas it overlies glacial till.

The landscape in the northern half of the county has been studied in detail *(10)*. It was previously thought that this part of the county was part of the Iowan stage of glaciation; however, subsurface investigations and studies have shown that Iowan till does not exist but that an erosion-surface complex does exist in the Iowan till region. The Iowan erosional surface is multilevel. It is arranged in a series of steps from the major drainageways toward boundary divides. The highest areas on the Iowan erosional surface are small elliptical hills or elongated ridges called pahas (fig. 12). Below the pahas, the Iowan erosional surface cuts into the Kansan till and a stone line or layer of sand separates the loess and the glacial till. The stone line occurs on all levels of the stepped surfaces. It also underlies upland drainageways *(8)*. The pahas are oriented in a distinct northwest to southeast direction.

Garwin, Muscatine, and Tama soils formed in 4 to 8 feet of loess. They are in the northern part of the county. Killduff, Garwin, Muscatine, and Tama soils formed in as much as 20 feet of loess. They are in the southern part of the county on the stable upland divides of the Kansan till plain. Downs, Fayette, and Timula soils formed in more than 20 feet of loess. They are on the forested pahas and on the steep slopes along the Iowa River. Soils on Four-Mile Creek Paha in the north-central part of the county formed in as much as 30 feet of loess. Soils on Casey's Paha in the northeastern part of the county formed in at least 20 feet, if not as much as 35 feet, of loess *(10)*.

Alluvium is material deposited by water. Alluvial deposits of Late Wisconsin and Holocene age are on flood plains and terraces in Tama County. About

Figure 12.—Hay and pasture on a moderately sloping paha in the background. The soybeans in the foreground are in an area of Garwin silty clay loam.

17 percent of the soils in the county formed in alluvium. The major areas of these soils are along the Iowa River and Wolfe Creek and their tributaries. The flood plains along the Iowa River and some of the alluvial terraces are large. The flood plain along the Iowa River from the city of Tama to the eastern edge of the county is 0.5 mile to 1.5 miles wide. The stream terrace near the junction of Otter Creek and the Iowa River is about 960 acres in size. The stream terrace near the junction of Salt Creek and the Iowa River is about 1,200 acres in size.

Much of the alluvium in the county washed from soils on loess-covered slopes in the uplands. Many of the alluvial sediments are silty and low in content of sand. Examples of silty soils on flood plains are the Ackmore, Colo, Lawson, Nodaway, and Zook soils. The alluvium that the Ackmore and Nodaway soils formed in was deposited very recently. As a result, these soils exhibit very little soil development. Colo, Lawson, and Zook soils generally show some soil development in the subsoil.

The soils on terraces or second bottoms are above the existing flood plain and generally are not flooded. Most are underlain by coarser textured material within a depth of 5 to 7 feet. The coarser textured material is commonly coarse sand and gravel, but in some areas it

is coarse sand. The silty alluvial soils on terraces are the Bremer, Canoe, Festina, Humeston, Nevin, and Wiota soils.

Although the soils on flood plains and terraces formed in silty material that was similar, the texture of the soils differs. Bremer, Humeston, and Zook soils are silty clay that has 40 percent or more clay. Nodaway and Lawson soils are silt loam that has 25 percent or less clay.

Some of the silty alluvium has been transported only a short distance and has accumulated at the foot of the slope on which it originated. This material is called local alluvium and retains many of the characteristics of the soils from which it has eroded. Judson and Ely soils formed in local alluvium. They are at the foot of slopes, directly below loess-derived soils.

Glacial drift is all rock material transported and 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. The Nebraskan Glaciation, which was the first of the glacial advances in the survey area, occurred 750,000 years ago *(6, 7)*. It was followed by the Kansan Glaciation, which occurred about 500,000 years ago.

In most areas of the county, loess overlies the till of the Kansan or Nebraskan Glaciation. It is 5 to more than 30 feet thick. The different kinds of till are not readily differentiated in the county. Geologic erosion has removed the loess on some of the side slopes. The till and paleosols of the glaciations and interglacial periods have been exposed on these side slopes. The paleosols developed in the till during the Yarmouth and Sangamon interglacial stages. This soil development occurred before the loess was deposited. The soils were strongly developed and had a gray or reddish clayey subsoil. Clarinda soils formed in the gray paleosol, and Armstrong and Keswick soils formed in the reddish paleosol. The gray and reddish paleosols remain in a few areas; however, in most areas geologic erosion has cut into and below the paleosols into the Kansan and Nebraskan till. In these places the till is only slightly weathered at the surface. It was exposed during the Wisconsin Stage of the Quaternary period *(9)*. Gara and Lindley soils formed in the slightly weathered glacial till. Armstrong, Gara, Keswick, and Lindley soils are in the Fayette-Downs association.

The Dinsdale-Tama association has extensive areas of exposed glacial till. The till in this part of the county was truncated during the early part of the loess deposition in the Wisconsin age. The truncated till surface is known as the Iowan erosional surface *(9)*. Several levels of summits occur in a gradual progression from the stream valleys towards the low crests that mark the drainage divides. Other features typical of the Iowan erosional surface are erratics and pahas. The erratics are large boulders that are partially buried or lying on the surface of the soil. The core of the paha is an erosional remnant of the Kansan till. The Yarmouth-Sangamon paleosol is intact in the areas of the pahas *(10)*.

The Iowan erosional surface is about 15 to 60 feet lower than the adjacent Kansan surface on the pahas. The loess cap is thinner on the shoulders and side slopes. Dinsdale soils formed in 20 to 40 inches of loess overlying glacial till. Where the loess is only a few inches thick, a loamy surface sediment formed over the glacial till. Liscomb soils formed in these areas.

Sandy eolian material, which is deposited by wind, is not extensive in the county. It is in the uplands along the Iowa River. It has a much higher content of sand than the loess deposits and a lower content of clay. This material occurs as low mounds or dunes on ridgetops and side slopes. The dunes are commonly underlain by loess at varying depths.

The sandy eolian material mainly consists of fine and very fine quartz that is highly resistant to weathering. It has been altered appreciably since it was deposited. Chelsea, Dickinson, and Lamont soils formed mainly in sandy eolian material. Bolan soils also developed in sandy eolian material, but the surface layer is loamy rather than sandy.

Climate

The soils in Tama County formed under the influence of a midcontinental, subhumid climate for at least 5,000 years. The morphology and properties of most of the soils indicate that the climate under which they formed was similar to the present one. The influence of the general climate in a region is modified by local conditions in or near the developing soils. For example, soils on south-facing slopes formed under a microclimate that is warmer and drier than the average climate of nearby areas, and the poorly drained soils on bottom land formed under a wetter and cooler climate than most of the soils around them. These local differences influence the characteristics of the soil and account for some of the differences among soils in the same climatic region.

Plant and Animal Life

Many changes in climate and vegetation have taken place in Iowa during the past 28,000 years *(7)*. The vegetation 28,000 to 11,000 years ago was dominated by coniferous forest with a transitional period of birch and alder. Deciduous forest dominated the vegetation 11,000 to 9,000 years ago. A very dry period occurred between 9,000 to 3,200 years ago. Prairie vegetation

was dominant during that period. Trees, especially oak, have invaded the prairie since 3,200 years ago, but the prairie vegetation is still dominant.

For the past 3,200 years, the soils in the county have been influenced by two main kinds of vegetation—prairie grasses and trees. Big bluestem and little bluestem were the main prairie grasses. The trees, which were mainly deciduous, included oak, hickory, ash, elm, and maple.

Studies of the effects of vegetation on soils similar to those in the county indicate that vegetation shifted while soils developed in areas bordering both trees and grasses. The morphology of the Downs, Gara, and Waubeek soils reflects the influence of trees and grasses. Chelsea, Fayette, and Lindley soils reflect the influence of trees. Tama, Muscatine, Liscomb, Garwin, and Colo soils reflect the influence of grasses.

In most places the soils that formed under trees are lighter colored, are more acid, and have a thinner surface layer that is lower in organic matter content than soils that formed under grasses. The soils in the county that formed under a shifting vegetation or mixed grasses and trees have properties that are intermediate between the properties of soils formed under grasses and those of soils formed under trees.

Burrowing animals and earthworms help to keep the soil open and porous. Bacteria and fungi help to decompose vegetation, thus releasing nutrients for plants.

Relief

Relief can cause important differences among soils. It indirectly influences soil formation through its effect on drainage. The soils in the county range from level to very steep. In many areas of bottom land, the nearly level soils are frequently flooded and have a permanent or a seasonal high water table. Water soaks into the nearly level soils that are not flooded. Much of the rainfall runs off the steep soils or uplands.

The level soils in the county are on broad upland flats and on stream bottoms. The very steepest soils are generally on slopes near the major streams and their tributaries. The intricate pattern of upland drainageways indicates that in most of the county the landscape has been modified by geologic processes.

Generally, the soils in Tama County that formed in areas where the seasonal high water table was well below the subsoil have a yellowish brown subsoil. They include the Dinsdale, Downs, Fayette, Liscomb, and Tama soils. Atterberry, Ely, Muscatine, and Nevin soils formed in areas where the seasonal high water table fluctuated and was periodically high.

Bremer, Colo, Garwin, and Zook soils formed under prairie grasses. They have a seasonal high water table and are poorly drained. They have a higher organic matter content in the surface layer than well drained soils that formed under prairie grasses.

Clay accumulates in the subsoil of soils that are in slight depressions. The clay particles are carried downward by the large amount of water that enters the soils. Sperry and Humeston soils are examples of such soils. They are referred to as claypan soils because they have a hard layer where the greatest amount of clay accumulates.

Dinsdale, Liscomb, and Tama soils, which have a wide range of slope, have some properties that change as slope increases. Two of these properties are the depth to carbonates and the thickness of the surface layer. The depth to carbonates decreases as the slope increases.

Time

Time is required for a soil to develop. A young soil has weakly defined horizons or does not show evidence of horizon development. Most of the soils on the flood plains are young soils because the soil material has not been in place long enough for distinct horizons to develop.

The effects of time are evidenced by the increase of clay in the subsoil. A higher content of clay in the subsoil than in the surface layer is an indication that a high degree of soil profile development has taken place. This information can be important because soils that have a high content of clay in the subsoil generally have poorer drainage.

Soil material generally is removed from soils on steep slopes before the soils have time to develop a thick profile and strong horizons. Also, much of the water runs off the slopes rather than infiltrating into the soil material, so that even though the material has been in place for a long time, the soil may exhibit little development.

Most of the parent material is thousands of years old. The present land surface and many of the soils are much younger because of recent geologic erosion *(9)*. The oldest soils in the county formed in loess on upland summits and on nearly level, loess-covered stream benches. They include the Garwin, Muscatine, Sperry, and Tama soils. They may be 14,000 years old *(6)*. Liscomb soils and other strongly sloping soils on the Iowan erosional surface are 2,000 or less years old. Gara and Lindley soils and other soils that are strongly sloping or steeper and are on the Kansas till plain are 6,800 or less years old. Soils that formed in alluvium or in sandy eolian material are only a few thousand or less years old. Wiota and Waukegan soils formed in alluvium

on stream benches, and Colo, Lawson, and Zook soils formed in alluvium on flood plains. Wiota and Waukegan soils are the oldest alluvial soils. Chelsea, Dickinson, and Lamont soils, which formed in sandy eolian material, are younger than the Wiota and Waukegan soils. Colo, Lawson, and Zook soils are younger than the Chelsea, Dickinson, and Lamont soils. Ackmore and Nodaway soils formed in alluvium. They are less than 125 years old.

Human Activities

Important changes take place when soils are cultivated. Some of these changes have little effect on productivity; others have a drastic effect. Changes caused by erosion generally are most apparent. On many of the cultivated soils in the county, particularly the gently rolling to hilly soils, part or all of the original surface layer has been lost through sheet erosion. In places shallow to deep gullies have formed.

In 1983, a productivity study of eroded soils in Iowa, including those in Tama County, was started. Soil descriptions and laboratory data of selected sites are available at the local office of the Natural Resources Conservation Service. Initial results show that as slope and erosion increase, yields decrease. In addition, the need for fertilizer and other chemicals increases as the rate of erosion increases.

Ackmore and Nodaway soils formed in stratified silty alluvium on alluvial fans and flood plains. This alluvium has been deposited on the bottom land during the past 125 years, or during the time that the soils have been cultivated. The topsoil of many of the sloping soils has been eroded by water and has been deposited on the flood plains. About 25 percent of the soils in the county are eroded.

In many fields where the soil is continuously cultivated, the granular structure of the soil that was apparent when the soil was in grassland is no longer present. In these fields the surface of the soil tends to bake and harden when it dries. Fine textured soils that are plowed when they are wet tend to puddle and are less permeable than similar soils in noncultivated areas. Poor seedling emergence and root penetration are management concerns in the cultivated areas.

Much has been done to increase the productivity of soils and to reclaim areas not suitable for crops. Large areas of bottom land have been made suitable for cultivation by installing drainage ditches and constructing diversions and dikes. Installing drainage systems on broad flats and nearly level soils, such as Garwin and Bremer soils, has greatly improved the productivity of the soils for cultivated crops. Applying commercial fertilizers has helped to overcome deficiencies in plant nutrients and has made some soils more productive than they were in their natural state.

Processes of Horizon Differentiation

Horizon differentiation is caused by four basic kinds of change. These are additions, removals, transfers, and transformations *(11)*. Each of these four kinds of change affects many of the substances that make up soils, such as organic matter, soluble salts, carbonates, sesquioxides, and silicate clay minerals. In general, these processes tend to promote horizon differentiation, but some tend to offset or retard it. The processes and the resulting changes proceed simultaneously in soils, and the ultimate nature of the profile is governed by the balance of these changes.

The accumulation of organic matter is an early step in the process of horizon differentiation in most soils. The content of organic matter ranges from very high to very low in the surface layer of the soils in Tama County. Some soils that formerly had a high content of organic matter now have a low one because of erosion. The accumulation of organic matter has been an important process in the differentiation of soil horizons in the county.

The removal of substances from parts of the soil profile is important in the differentiation of soil horizons. The downward movement of calcium carbonates and other bases is an example. All of the soils in the county, except for the Timula soils, have been leached free of calcium carbonates in the upper part of the profile. Some of the soils have been so strongly leached that they are strongly acid or very strongly acid in the subsoil.

Phosphorus is removed from the subsoil by plant roots and transferred to other parts of the plant. The plant residue then adds the phosphorus to the surface layer. This process affects the form and distribution of phosphorus in the soil.

The translocation of silicate clay minerals is another important process. The clay minerals are carried downward in suspension in percolating water from the surface layer. They accumulate in the subsoil in pores and root channels and as clay films. This process has affected many of the soils in the county. In other soils, however, the content of clay in the horizons is not markedly different and other evidence of clay movement is minimal.

Another kind of transfer that is minimal in most soils, but occurs to some extent in very clayey soils, is that brought about by shrinking and swelling. This process causes cracks to form and helps to incorporate material from the surface layer into the lower part of the profile. Clarinda and Zook soils are examples of soils with

potential for this kind of physical transfer.

Transformations are physical and chemical. The weathering of soil particles to smaller sizes is an example of a transformation. Gleying, or the reduction of iron, is an example of a physical transformation. This process occurs when poorly drained soils, such as the Garwin and Colo soils, are saturated with water for long periods. These soils have enough organic matter for biological activity to take place during the periods of saturation. Gleying is evidenced by the presence of ferrous iron and gray colors. Reductive extractable iron, or free iron, generally is lower in somewhat poorly drained soils, such as Muscatine and Nevin soils. Another kind of transformation is the weathering of the primary apatite mineral in the parent material to secondary phosphorus compounds.

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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

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bottom land. The normal flood plain of a stream, subject to flooding.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse textured soil. Sand or loamy sand.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers.

Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

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.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1)

accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Paha. A small elliptical hill or elongated ridge.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

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.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

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.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

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.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the

horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

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.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). 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.

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.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-87 at Toledo, Iowa)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	26.6	7.1	16.9	52	-22	0	0.91	0.25	1.43	3	6.7
February	32.8	13.0	22.9	59	-18	0	1.02	.32	1.58	3	5.6
March	43.3	23.7	33.5	77	-5	18	2.37	1.05	3.49	6	6.0
April	59.7	37.0	48.4	86	16	83	3.45	2.15	4.61	7	1.1
May	71.3	47.8	59.6	89	30	313	4.49	2.42	6.30	8	.0
June	80.3	57.5	68.9	95	41	567	4.49	2.37	6.33	7	.0
July	84.7	61.8	73.3	98	47	722	4.25	2.10	6.11	7	.0
August	82.4	59.4	70.9	97	44	648	4.53	1.85	6.78	6	.0
September	75.0	50.1	62.6	94	30	378	3.52	1.59	5.16	6	.0
October	63.9	38.9	51.4	87	19	148	2.41	.76	3.74	5	.0
November	46.9	26.7	36.8	72	1	10	1.94	.54	3.06	4	1.7
December	32.2	14.4	23.3	59	-16	0	1.18	.58	1.70	3	6.4
Yearly:											
Average	58.3	36.5	47.4	---	---	---	---	---	---	---	---
Extreme	---	---	---	99	-24	---	---	---	---	---	---
Total	---	---	---	---	---	2,887	34.56	28.71	40.10	65	27.5

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-87 at Toledo, 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. 20	May 3	May 17
2 years in 10 later than--	Apr. 16	Apr. 28	May 12
5 years in 10 later than--	Apr. 8	Apr. 19	May 2
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 8	Sept. 27	Sept. 22
2 years in 10 earlier than--	Oct. 14	Oct. 3	Sept. 26
5 years in 10 earlier than--	Oct. 25	Oct. 14	Oct. 5

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-87 at Toledo, 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	179	157	136
8 years in 10	186	164	143
5 years in 10	199	178	156
2 years in 10	212	191	168
1 year in 10	218	198	175

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
5B	Ackmore-Colo complex, 2 to 5 percent slopes	11,225	2.4
7	Wiota silt loam, 0 to 2 percent slopes	6,170	1.3
7B	Wiota silt loam, 2 to 5 percent slopes	2,500	0.5
8B	Judson silty clay loam, 2 to 5 percent slopes	1,595	0.3
11B	Colo-Ely complex, 2 to 5 percent slopes	25,740	5.6
20C2	Killduff silty clay loam, 5 to 9 percent slopes, moderately eroded	370	0.1
20D2	Killduff silty clay loam, 9 to 14 percent slopes, moderately eroded	640	0.1
20D3	Killduff silty clay loam, 9 to 14 percent slopes, severely eroded	680	0.1
20E2	Killduff silty clay loam, 14 to 18 percent slopes, moderately eroded	240	0.1
20E3	Killduff silty clay loam, 14 to 18 percent slopes, severely eroded	200	*
24D2	Shelby loam, 9 to 14 percent slopes, moderately eroded	540	0.1
24D3	Shelby clay loam, 9 to 14 percent slopes, severely eroded	275	0.1
24E2	Shelby loam, 14 to 18 percent slopes, moderately eroded	495	0.1
24E3	Shelby clay loam, 14 to 18 percent slopes, severely eroded	540	0.1
43	Bremer silty clay loam, 0 to 2 percent slopes	11,700	2.5
63D	Chelsea loamy fine sand, 5 to 14 percent slopes	500	0.1
63F	Chelsea loamy fine sand, 14 to 25 percent slopes	640	0.1
65D2	Lindley loam, 9 to 14 percent slopes, moderately eroded	285	0.1
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded	630	0.1
65E3	Lindley clay loam, 14 to 18 percent slopes, severely eroded	540	0.1
65F	Lindley loam, 18 to 25 percent slopes	360	0.1
65F2	Lindley loam, 18 to 25 percent slopes, moderately eroded	1,765	0.4
65F3	Lindley clay loam, 18 to 25 percent slopes, severely eroded	1,090	0.2
65G	Lindley loam, 25 to 40 percent slopes	2,185	0.5
83B	Kenyon loam, 2 to 5 percent slopes	260	0.1
83C2	Kenyon loam, 5 to 9 percent slopes, moderately eroded	600	0.1
88	Nevin silty clay loam, 0 to 2 percent slopes	11,820	2.6
110C	Lamont fine sandy loam, 5 to 9 percent slopes	225	*
118	Garwin silty clay loam, 0 to 2 percent slopes	7,835	1.7
119	Muscatine silty clay loam, 0 to 2 percent slopes	17,945	3.9
119B	Muscatine silty clay loam, 2 to 5 percent slopes	2,550	0.6
120	Tama silty clay loam, 0 to 2 percent slopes	660	0.1
120B	Tama silty clay loam, 2 to 5 percent slopes	60,075	13.2
120B2	Tama silty clay loam, 2 to 5 percent slopes, moderately eroded	2,140	0.5
120C	Tama silty clay loam, 5 to 9 percent slopes	8,060	1.7
120C2	Tama silty clay loam, 5 to 9 percent slopes, moderately eroded	29,555	6.5
120C3	Tama silty clay loam, 5 to 9 percent slopes, severely eroded	225	*
120D2	Tama silty clay loam, 9 to 14 percent slopes, moderately eroded	5,185	1.1
120D3	Tama silty clay loam, 9 to 14 percent slopes, severely eroded	1,300	0.3
120E2	Tama silty clay loam, 14 to 18 percent slopes, moderately eroded	320	0.1
122	Sperry silt loam, 0 to 1 percent slopes	200	*
133	Colo silty clay loam, 0 to 2 percent slopes	20,175	4.4
133+	Colo silt loam, overwash, 0 to 2 percent slopes	6,210	1.3
134	Zook silty clay, 0 to 2 percent slopes	1,090	0.2
162B	Downs silt loam, 2 to 5 percent slopes	2,515	0.5
162C	Downs silt loam, 5 to 9 percent slopes	2,640	0.6
162C2	Downs silt loam, 5 to 9 percent slopes, moderately eroded	5,390	1.2
162D	Downs silt loam, 9 to 14 percent slopes	810	0.2
162D2	Downs silt loam, 9 to 14 percent slopes, moderately eroded	7,275	1.6
162D3	Downs silty clay loam, 9 to 14 percent slopes, severely eroded	880	0.2
162E2	Downs silt loam, 14 to 18 percent slopes, moderately eroded	3,390	0.7
162E3	Downs silty clay loam, 14 to 18 percent slopes, severely eroded	1,885	0.4
162F	Downs silt loam, 18 to 25 percent slopes	200	*
162F2	Downs silt loam, 18 to 25 percent slopes, moderately eroded	790	0.2
162F3	Downs silty clay loam, 18 to 25 percent slopes, severely eroded	350	0.1
163B	Fayette silt loam, 2 to 5 percent slopes	2,255	0.5
163C	Fayette silt loam, 5 to 9 percent slopes	5,170	1.1
163C2	Fayette silt loam, 5 to 9 percent slopes, moderately eroded	5,655	1.2
163D	Fayette silt loam, 9 to 14 percent slopes	660	0.1
163D2	Fayette silt loam, 9 to 14 percent slopes, moderately eroded	10,460	2.3
163D3	Fayette silty clay loam, 9 to 14 percent slopes, severely eroded	515	0.1
163E	Fayette silt loam, 14 to 18 percent slopes	1,530	0.3

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
163E2	Fayette silt loam, 14 to 18 percent slopes, moderately eroded	8,170	1.8
163E3	Fayette silty clay loam, 14 to 18 percent slopes, severely eroded	3,200	0.7
163F	Fayette silt loam, 18 to 25 percent slopes	3,330	0.7
163F2	Fayette silt loam, 18 to 25 percent slopes, moderately eroded	8,040	1.7
163F3	Fayette silty clay loam, 18 to 25 percent slopes, severely eroded	1,910	0.4
163G	Fayette silt loam, 25 to 40 percent slopes	6,500	1.4
164	Traer silt loam, 0 to 2 percent slopes	200	*
174B	Bolan loam, 2 to 5 percent slopes	235	0.1
174C	Bolan loam, 5 to 9 percent slopes	440	0.1
175B	Dickinson fine sandy loam, 2 to 5 percent slopes	200	*
175C	Dickinson fine sandy loam, 5 to 9 percent slopes	270	0.1
179D2	Gara loam, 9 to 14 percent slopes, moderately eroded	630	0.1
179D3	Gara clay loam, 9 to 14 percent slopes, severely eroded	200	*
179E2	Gara loam, 14 to 18 percent slopes, moderately eroded	705	0.2
179E3	Gara clay loam, 14 to 18 percent slopes, severely eroded	350	0.1
179F2	Gara loam, 18 to 25 percent slopes, moderately eroded	280	0.1
179F3	Gara clay loam, 18 to 25 percent slopes, severely eroded	235	0.1
220	Nodaway silt loam, 0 to 2 percent slopes	780	0.2
222D2	Clarinda silty clay loam, 9 to 14 percent slopes, moderately eroded	220	*
226	Lawler loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes	310	0.1
269	Humeston silt loam, 0 to 2 percent slopes	1,170	0.3
291	Atterberry silt loam, 0 to 2 percent slopes	330	0.1
293D	Chelsea-Lamont-Fayette complex, 9 to 14 percent slopes	870	0.2
293D2	Chelsea-Lamont-Fayette complex, 9 to 14 percent slopes, moderately eroded	740	0.2
293E	Chelsea-Lamont-Fayette complex, 14 to 18 percent slopes	520	0.1
293E2	Chelsea-Lamont-Fayette complex, 14 to 18 percent slopes, moderately eroded	955	0.2
293F	Chelsea-Lamont-Fayette complex, 18 to 25 percent slopes	740	0.2
293F2	Chelsea-Lamont-Fayette complex, 18 to 25 percent slopes, moderately eroded	270	0.1
293G	Chelsea-Lamont-Fayette complex, 25 to 40 percent slopes	760	0.2
350	Waukegan silt loam, 0 to 2 percent slopes	515	0.1
350B	Waukegan silt loam, 2 to 5 percent slopes	1,015	0.2
350C	Waukegan silt loam, 5 to 9 percent slopes	530	0.1
354	Aquolls, ponded	2,040	0.4
377B	Dinsdale silty clay loam, 2 to 5 percent slopes	12,045	2.6
377B2	Dinsdale silty clay loam, 2 to 5 percent slopes, moderately eroded	1,270	0.3
377C	Dinsdale silty clay loam, 5 to 9 percent slopes	4,680	1.0
377C2	Dinsdale silty clay loam, 5 to 9 percent slopes, moderately eroded	29,050	6.4
377D2	Dinsdale silty clay loam, 9 to 14 percent slopes, moderately eroded	4,670	1.0
377D3	Dinsdale silty clay loam, 9 to 14 percent slopes, severely eroded	5,460	1.2
420B	Tama silty clay loam, benches, 2 to 5 percent slopes	2,880	0.6
420C	Tama silty clay loam, benches, 5 to 9 percent slopes	200	*
424E2	Lindley-Keswick complex, 14 to 18 percent slopes, moderately eroded	240	0.1
424F2	Lindley-Keswick complex, 18 to 25 percent slopes, moderately eroded	570	0.1
424F3	Lindley-Keswick complex, 18 to 25 percent slopes, severely eroded	455	0.1
428B	Ely silty clay loam, 2 to 5 percent slopes	2,845	0.6
429D2	Downs-Lamont complex, 9 to 14 percent slopes, moderately eroded	805	0.2
429E2	Downs-Lamont complex, 14 to 18 percent slopes, moderately eroded	650	0.1
429E3	Downs-Lamont complex, 14 to 18 percent slopes, severely eroded	265	0.1
429F2	Downs-Lamont complex, 18 to 25 percent slopes, moderately eroded	205	*
430	Ackmore silt loam, 0 to 2 percent slopes	2,180	0.5
430B	Ackmore silt loam, 2 to 5 percent slopes	2,995	0.6
462B	Downs silt loam, benches, 2 to 5 percent slopes	700	0.2
462C	Downs silt loam, benches, 5 to 9 percent slopes	655	0.1
478G	Emeline-Rock outcrop complex, 25 to 60 percent slopes	205	*
484	Lawson silt loam, 0 to 2 percent slopes	1,175	0.3
485	Spillville loam, 0 to 2 percent slopes	310	0.1
673D2	Timula silt loam, 9 to 14 percent slopes, moderately eroded	210	*
673D3	Timula silt loam, 9 to 14 percent slopes, severely eroded	200	*
673E2	Timula silt loam, 14 to 18 percent slopes, moderately eroded	1,820	0.4
673E3	Timula silt loam, 14 to 18 percent slopes, severely eroded	1,930	0.4
673F2	Timula silt loam, 18 to 25 percent slopes, moderately eroded	2,155	0.5
673F3	Timula silt loam, 18 to 25 percent slopes, severely eroded	1,330	0.3

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
673G	Timula silt loam, 25 to 40 percent slopes	560	0.1
683C2	Liscomb loam, 5 to 9 percent slopes, moderately eroded	875	0.2
683D2	Liscomb loam, 9 to 14 percent slopes, moderately eroded	3,865	0.8
683D3	Liscomb loam, 9 to 14 percent slopes, severely eroded	810	0.2
683E2	Liscomb loam, 14 to 18 percent slopes, moderately eroded	700	0.2
683E3	Liscomb loam, 14 to 18 percent slopes, severely eroded	565	0.1
771B	Waubeek silt loam, 2 to 5 percent slopes	330	0.1
771C	Waubeek silt loam, 5 to 9 percent slopes	200	*
771C2	Waubeek silt loam, 5 to 9 percent slopes, moderately eroded	680	0.1
771D2	Waubeek silt loam, 9 to 14 percent slopes, moderately eroded	315	0.1
926	Canoe silt loam, 0 to 2 percent slopes	545	0.1
933B	Sawmill silty clay loam, 1 to 4 percent slopes	5,675	1.2
978	Festina silt loam, 0 to 2 percent slopes	655	0.1
993E2	Gara-Armstrong complex, 14 to 18 percent slopes, moderately eroded	340	0.1
993E3	Gara-Armstrong complex, 14 to 18 percent slopes, severely eroded	205	*
1133	Colo silty clay loam, channeled, 0 to 2 percent slopes	11,530	2.5
1220	Nodaway silt loam, channeled, 0 to 2 percent slopes	3,510	0.8
1485	Spillville loam, channeled, 0 to 2 percent slopes	1,015	0.2
5010	Pits, sand and gravel	170	*
5030	Pits, limestone quarries	265	0.1
5040	Orthents, loamy	340	0.1
5080	Orthents, loamy, nearly level	30	*
	Water	600	*
	Total	462,300	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
5B	Ackmore-Colo complex, 2 to 5 percent slopes (where drained)
7	Wiota silt loam, 0 to 2 percent slopes
7B	Wiota silt loam, 2 to 5 percent slopes
8B	Judson silty clay loam, 2 to 5 percent slopes
11B	Colo-Ely complex, 2 to 5 percent slopes (where drained)
43	Bremer silty clay loam, 0 to 2 percent slopes (where drained)
83B	Kenyon loam, 2 to 5 percent slopes
88	Nevin silty clay loam, 0 to 2 percent slopes
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
120	Tama silty clay loam, 0 to 2 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)
133+	Colo silt loam, overwash, 0 to 2 percent slopes (where drained)
134	Zook silty clay, 0 to 2 percent slopes (where drained)
162B	Downs silt loam, 2 to 5 percent slopes
163B	Fayette silt loam, 2 to 5 percent slopes
164	Traer silt loam, 0 to 2 percent slopes (where drained)
174B	Bolan loam, 2 to 5 percent slopes
175B	Dickinson fine sandy loam, 2 to 5 percent slopes
220	Nodaway silt loam, 0 to 2 percent slopes
226	Lawler loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes
269	Humeston silt loam, 0 to 2 percent slopes (where drained)
291	Atterberry silt loam, 0 to 2 percent slopes (where drained)
350	Waukegan silt loam, 0 to 2 percent slopes
350B	Waukegan silt loam, 2 to 5 percent slopes
377B	Dinsdale silty clay loam, 2 to 5 percent slopes
377B2	Dinsdale silty clay loam, 2 to 5 percent slopes, moderately eroded
420B	Tama silty clay loam, benches, 2 to 5 percent slopes
428B	Ely silty clay loam, 2 to 5 percent slopes
430	Ackmore silt loam, 0 to 2 percent slopes (where drained)
430B	Ackmore silt loam, 2 to 5 percent slopes (where drained)
462B	Downs silt loam, benches, 2 to 5 percent slopes
484	Lawson silt loam, 0 to 2 percent slopes (where drained)
485	Spillville loam, 0 to 2 percent slopes
771B	Waubeek silt loam, 2 to 5 percent slopes
926	Canoe silt loam, 0 to 2 percent slopes
933B	Sawmill silty clay loam, 1 to 4 percent slopes (where drained)
978	Festina silt loam, 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 bromegrass	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
5B---------- Ackmore-Colo	IIw	68	130	44	78	3.9	3.2	5.3	6.5
7---------- Wiota	I	95	163	55	98	6.8	4.0	6.7	11.4
7B---------- Wiota	IIe	90	160	54	96	6.7	3.9	6.6	11.2
8B---------- Judson	IIe	90	159	53	95	6.7	3.9	6.5	11.2
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
20D2---------- Killduff	IIIe	63	144	48	86	6.0	3.5	5.9	10.0
20D3---------- Killduff	IVe	58	136	46	82	5.7	3.3	5.6	9.5
20E2---------- Killduff	IVe	53	127	43	76	5.3	3.1	5.2	8.6
20E3---------- Killduff	VIe	48	---	---	---	5.0	2.9	4.9	8.4
24D2---------- Shelby	IIIe	48	115	35	69	4.8	2.8	4.7	8.0
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
43---------- Bremer	IIw	82	139	47	83	4.2	3.4	5.7	7.0

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 bromegrass	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
63D---------- Chelsea	VIs	11	---	---	---	2.3	1.3	2.2	3.8
63F---------- Chelsea	VIIs	5	---	---	---	---	0.7	---	---
65D2---------- Lindley	IVe	38	97	30	58	4.1	2.4	4.0	6.8
65E2---------- Lindley	VIe	28	---	---	---	3.4	2.0	3.3	---
65E3---------- Lindley	VIIe	25	---	---	---	---	1.8	---	---
65F---------- Lindley	VIIe	10	---	---	---	---	1.8	---	---
65F2---------- Lindley	VIIe	8	---	---	---	---	1.7	---	---
65F3---------- Lindley	VIIe	5	---	---	---	---	1.5	---	---
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
88---------- Nevin	I	90	163	55	98	6.5	4.0	6.7	10.9
110C---------- Lamont	IIIe	32	89	27	53	3.7	2.2	3.6	6.2
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

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 bromegrass	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
120 Tama	I	100	170	57	102	7.1	4.2	7.0	11.9
120B Tama	IIe	95	167	56	100	7.0	4.1	6.8	11.7
120B2 Tama	IIe	93	163	55	98	6.8	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	11.0
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
120D3 Tama	IVe	65	141	47	85	5.9	3.5	5.8	9.9
120E2 Tama	IVe	58	132	44	79	5.5	3.2	5.4	9.2
122 Sperry	IIIw	63	124	42	74	3.7	3.1	5.1	6.2
133 Colo	IIw	80	136	46	82	4.1	3.3	5.6	6.8
133+ Colo	IIw	85	140	47	84	4.2	3.4	5.7	7.0
134 Zook	IIIw	65	117	39	70	3.5	2.9	4.8	5.8
162B Downs	IIe	90	158	53	95	6.6	3.9	6.5	11.0
162C Downs	IIIe	75	153	51	92	6.4	3.8	6.3	10.7
162C2 Downs	IIIe	73	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 bromegrass	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
162D---------- Downs	IIIe	65	144	48	86	6.0	3.5	5.9	10.0
162D2---------- Downs	IIIe	63	140	47	84	5.9	3.4	5.7	9.9
162D3---------- Downs	IVe	60	132	44	79	5.5	3.2	5.4	9.2
162E2---------- Downs	IVe	53	123	41	74	5.2	3.0	5.0	8.7
162E3---------- Downs	VIe	50	---	---	---	4.8	2.8	4.7	8.0
162F---------- Downs	VIe	35	---	---	---	4.9	2.9	4.8	8.2
162F2---------- Downs	VIe	33	---	---	---	4.7	2.8	4.6	7.9
162F3---------- Downs	VIIe	30	---	---	---	4.4	2.6	4.3	7.4
163B---------- Fayette	IIe	85	149	50	89	6.3	3.7	6.1	10.5
163C---------- Fayette	IIIe	70	144	48	86	6.0	3.5	5.9	10.0
163C2---------- Fayette	IIIe	68	140	47	84	5.9	3.4	5.7	9.9
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	8.7
163E---------- Fayette	IVe	50	118	40	71	5.0	2.9	4.8	8.4
163E2---------- Fayette	IVe	48	114	38	68	4.8	2.8	4.7	8.0

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 bromegrass	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
163E3---------- Fayette	VIe	45	---	---	---	4.5	2.6	4.3	7.5
163F---------- Fayette	VIe	30	---	---	---	4.5	2.7	4.4	7.5
163F2---------- Fayette	VIe	28	---	---	---	4.4	2.6	4.3	7.3
163F3---------- Fayette	VIe	25	---	---	---	---	2.4	---	6.7
163G---------- Fayette	VIIe	20	---	---	---	---	2.5	---	7.2
164---------- Traer	IIIw	60	119	40	71	3.6	2.9	4.9	6.0
174B---------- Bolan	IIe	70	121	37	73	5.1	3.0	5.0	8.5
174C---------- Bolan	IIIe	55	116	35	70	4.9	2.9	4.8	8.2
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	7.4
179D2---------- Gara	IVe	43	106	32	64	4.5	2.6	4.3	7.5
179D3---------- Gara	VIe	40	---	---	---	4.1	2.4	4.0	6.9
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	---	---

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 bromegrass	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
220 Nodaway	IIw	87	153	51	92	6.4	3.8	6.3	10.7
222D2 Clarinda	IVe	10	63	19	38	1.9	1.5	2.6	3.2
226 Lawler	IIs	78	138	42	83	5.5	3.4	5.7	9.2
269 Humeston	IIIw	58	110	37	66	3.3	2.7	4.5	5.5
291 Atterberry	I	95	153	51	92	6.1	3.8	6.3	10.2
293D Chelsea-Lamont-Fayette	IVe	24	69	23	41	2.9	1.7	2.8	4.8
293D2 Chelsea-Lamont-Fayette	IVe	21	66	22	40	2.8	1.6	2.7	4.7
293E Chelsea-Lamont-Fayette	VIe	14	---	---	---	2.2	1.3	2.8	3.7
293E2 Chelsea-Lamont-Fayette	VIe	11	---	---	---	2.1	1.2	2.0	3.5
293F Chelsea-Lamont-Fayette	VIIe	5	---	---	---	---	1.0	---	3.5
293F2 Chelsea-Lamont-Fayette	VIIe	5	---	---	---	---	1.0	---	---
293G Chelsea-Lamont-Fayette	VIIe	5	---	---	---	---	0.9	---	---
350 Waukegan	IIs	73	145	49	87	6.1	3.6	5.9	10.2
350B Waukegan	IIe	68	142	48	85	6.0	3.5	5.8	10.0

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 bromegrass	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
350C---------- Waukegan	IIIe	48	137	46	82	5.8	3.4	5.6	9.7
354***---------- Aquolls	VIIw	5	---	---	---	---	---	---	---
377B---------- Dinsdale	IIe	90	160	54	96	6.7	3.9	6.6	11.2
377B2---------- Dinsdale	IIe	88	156	52	94	6.6	3.8	6.4	11.0
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	10.5
377D2---------- Dinsdale	IIIe	63	142	48	85	6.0	3.5	5.8	10.0
377D3---------- Dinsdale	IVe	60	134	45	80	5.6	3.3	5.5	9.4
420B---------- Tama	IIe	95	167	56	100	7.0	4.1	6.8	11.7
420C---------- Tama	IIIe	80	162	54	97	6.8	4.0	6.6	11.4
424E2---------- Lindley-Keswick	VIe	5	---	---	---	2.4	1.4	2.3	4.0
424F2---------- Lindley-Keswick	VIIe	5	---	---	---	---	1.1	---	---
424F3---------- Lindley-Keswick	VIIe	5	---	---	---	---	0.6	---	---
428B---------- Ely	IIe	88	159	53	95	6.4	3.9	6.5	10.7
429D2---------- Downs-Lamont	IIIe	48	107	36	64	4.5	2.6	4.4	7.5
429E2---------- Downs-Lamont	IVe	38	90	30	54	3.8	2.2	3.7	6.3

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 bromegrass	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
429E3---------- Downs-Lamont	VIe	35	---	---	---	3.4	2.0	3.4	5.7
429F2---------- Downs-Lamont	VIe	18	---	---	---	3.4	2.0	3.3	5.7
430---------- Ackmore	IIw	83	141	47	85	4.2	3.5	5.8	7.0
430B---------- Ackmore	IIw	78	138	46	83	4.1	3.4	5.7	6.9
462B---------- Downs	IIe	90	158	53	95	6.6	3.9	6.5	11.0
462C---------- Downs	IIIe	75	153	51	92	6.4	3.8	6.3	10.7
478G**:									
Emeline----------	VIIs	5	---	---	---	---	0.5	---	---
Rock outcrop.									
484---------- Lawson	IIw	90	157	53	94	6.3	3.9	6.4	10.5
485---------- Spillville	IIw	92	156	48	94	6.2	3.8	6.4	10.4
673D2---------- Timula	IIIe	58	131	44	79	5.5	3.2	5.4	9.2
673D3---------- Timula	IVe	55	123	41	74	5.2	3.0	5.0	8.7
673E2---------- Timula	IVe	48	114	38	68	4.8	4.7	2.8	8.0
673E3---------- Timula	VIe	45	---	---	---	4.5	2.6	4.3	7.5
673F2---------- Timula	VIe	28	---	---	---	4.4	2.6	4.3	7.4
673F3---------- Timula	VIe	25	---	---	---	---	2.4	---	5.3

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 bromegrass	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
673G---------- Timula	VIIe	20	---	---	---	---	2.5	---	3.2
683C2---------- Liscomb	IIIe	69	148	45	89	6.2	3.6	6.1	10.4
683D2---------- Liscomb	IIIe	59	139	42	83	5.8	3.4	5.7	9.7
683D3---------- Liscomb	IVe	56	131	40	79	5.5	3.2	5.4	9.2
683E2---------- Liscomb	IVe	49	122	37	73	5.1	3.0	5.0	8.5
683E3---------- Liscomb	VIe	46	---	---	---	4.8	2.8	4.7	8.0
771B---------- Waubeek	IIe	85	151	51	91	6.3	3.7	6.2	10.5
771C---------- Waubeek	IIIe	70	146	49	88	6.1	3.6	6.0	10.2
771C2---------- Waubeek	IIIe	68	142	48	85	6.0	3.5	5.8	10.0
771D2---------- Waubeek	IIIe	58	133	45	80	5.6	3.3	5.5	9.4
926---------- Canoe	I	90	153	51	92	6.1	3.8	6.3	10.2
933B---------- Sawmill	IIw	80	133	45	80	4.0	3.3	5.5	6.7
978---------- Festina	I	90	153	51	92	6.4	3.8	6.3	10.7
993E2---------- Gara-Armstrong	VIe	10	---	---	---	2.7	1.6	2.7	4.5
993E3---------- Gara-Armstrong	VIe	5	---	---	---	1.9	1.1	1.8	3.2
1133---------- Colo	Vw	25	---	---	---	---	3.0	4.9	---

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 bromegrass	Bromegrass-alfalfa
		RV*	Bu	Bu	Bu	Tons	AUM**	AUM**	AUM**
1220---------- Nodaway	Vw	25	---	---	---	---	3.0	---	---
1485---------- Spillville	Vw	25	---	---	---	---	3.8	---	---
5010***, 5030***. Pits									
5040***, 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*	
5B**:										
Ackmore----------	3A	Slight	Slight	Slight	Slight	Moderate	White oak----------	65	3	Eastern white pine, red pine, cottonwood, sugar maple, black walnut.
Colo.										
43----------	2W	Slight	Severe	Moderate	Moderate	Severe	Silver maple--------	80	2	Silver maple, eastern
Bremer							Eastern cottonwood--	90	7	cottonwood, American sycamore, hackberry, green ash, northern whitecedar.
63D----------	3S	Slight	Slight	Moderate	Slight	Slight	White oak----------	55	3	Eastern white pine,
Chelsea										Scotch pine, European larch, eastern redcedar, red pine, jack pine.
63F----------	3R	Moderate	Severe	Moderate	Slight	Slight	White oak----------	55	3	Eastern white pine,
Chelsea										Scotch pine, European larch, eastern redcedar, red pine, jack pine.
65D2----------	3A	Slight	Slight	Slight	Slight	Severe	White oak----------	56	3	White oak, northern
Lindley							Northern red oak----	61	3	red oak, black oak.
							Black oak----------	63	3	
65E2, 65E3, 65F,										
65F2, 65F3, 65G---	3R	Moderate	Moderate	Slight	Slight	Severe	White oak----------	56	3	White oak, northern
Lindley							Northern red oak----	61	3	red oak, black oak.
							Black oak----------	63	3	
110C----------	3A	Slight	Slight	Slight	Slight	Moderate	Northern red oak----	55	3	Eastern white pine.
Lamont							White oak----------	55	3	
162B, 162C, 162C2,										
162D, 162D2-------	4A	Slight	Slight	Slight	Slight	Moderate	White oak----------	80	4	Northern red oak,
Downs							Northern red oak----	80	4	yellow-poplar,
							Yellow-poplar-------	90	6	eastern white pine,
							Black walnut--------	---	---	green ash.

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*	
162D3---------- Downs	4A	Slight	Slight	Slight	Slight	Moderate	White oak----------	80	4	Eastern white pine,
							Northern red oak----	80	4	northern red oak,
							Yellow-poplar-------	90	6	green ash, yellow-
							Black walnut--------	---	---	poplar.
162E2---------- Downs	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak----------	80	4	Northern red oak,
							Northern red oak----	80	4	yellow-poplar,
							Yellow-poplar-------	90	6	eastern white pine,
							Black walnut--------	---	---	green ash.
162E3---------- Downs	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak----------	80	4	Eastern white pine,
							Northern red oak----	80	4	northern red oak,
							Yellow-poplar-------	90	6	green ash, yellow-
							Black walnut--------	---	---	poplar.
162F, 162F2-------- Downs	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak----------	80	4	Northern red oak,
							Northern red oak----	80	4	yellow-poplar,
							Yellow-poplar-------	90	6	eastern white pine,
							Black walnut--------	---	---	green ash.
162F3---------- Downs	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak----------	80	4	Eastern white pine,
							Northern red oak----	80	4	northern red oak,
							Yellow-poplar-------	90	6	green ash, yellow-
							Black walnut--------	---	---	poplar.
163B, 163C--------- Fayette	4A	Slight	Slight	Slight	Slight	Moderate	White oak----------	80	4	Eastern white pine,
							Northern red oak----	80	4	northern red oak,
							Yellow-poplar-------	90	6	green ash, yellow-
							Black walnut--------	---	---	poplar.
163C2---------- Fayette	4A	Slight	Slight	Slight	Slight	Moderate	White oak----------	80	4	Northern red oak,
							Northern red oak----	80	4	yellow-poplar,
							Yellow-poplar-------	90	6	eastern white pine,
							Black walnut--------	---	---	green ash.
163D---------- Fayette	4A	Slight	Slight	Slight	Slight	Moderate	White oak----------	80	4	Eastern white pine,
							Northern red oak----	80	4	northern red oak,
							Yellow-poplar-------	90	6	green ash, yellow-
							Black walnut--------	---	---	poplar.
163D2---------- Fayette	4A	Slight	Slight	Slight	Slight	Moderate	White oak----------	80	4	Northern red oak,
							Northern red oak----	80	4	yellow-poplar,
							Yellow-poplar-------	90	6	eastern white pine,
							Black walnut--------	---	---	green ash.

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*	
163D3--Fayette	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.
163E--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.
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--Fayette	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak Northern red oak	65 65	4 4	Eastern white pine, red pine, black walnut, sugar maple.
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.
164--Traer	2W	Slight	Severe	Severe	Severe	Severe	Silver maple Eastern cottonwood	80 90	2 7	Eastern cottonwood.
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.
179D3--Gara	3A	Slight	Slight	Slight	Slight	Slight	White oak Northern red oak	55 55	3 3	Eastern white pine, red pine, white 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.

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*	
179E3---------- Gara	3R	Moderate	Moderate	Slight	Slight	Slight	White oak----------	55	3	Eastern white pine, red pine, white oak.
							Northern red oak----	55	3	
179F2---------- Gara	3R	Moderate	Moderate	Slight	Slight	Slight	White oak----------	55	3	Eastern white pine, red pine, white oak, northern red oak.
							Northern red oak----	55	3	
179F3---------- Gara	3R	Moderate	Moderate	Slight	Slight	Slight	White oak----------	55	3	Eastern white pine, red pine, white oak.
							Northern red oak----	55	3	
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----------	70	4	Eastern white pine, red pine, Scotch pine, eastern redcedar.
							Northern red oak----	70	4	
							Green ash----------	---	---	
							Bur oak----------	---	---	
293D**:										
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	Eastern white pine, northern red oak, green ash, yellow-poplar.
							Northern red oak----	80	4	
							Yellow-poplar-------	90	6	
							Black walnut--------	---	---	
293D2**:										
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	

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*	
293D2**:										
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	---	---	
293E**:										
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	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	---	---	
293E2**:										
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	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	---	---	
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	

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*	
293F**:										
Fayette	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak	80	4	Eastern white pine,
							Northern red oak	80	4	northern red oak,
							Yellow-poplar	90	6	green ash, yellow-
							Black walnut	---	---	poplar.
293F2**:										
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	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak	80	4	Northern red oak,
							Northern red oak	80	4	yellow-poplar,
							Yellow-poplar	90	6	eastern white pine,
							Black walnut	---	---	green ash.
293G**:										
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	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak	80	4	Eastern white pine,
							Northern red oak	80	4	northern red oak,
							Yellow-poplar	90	6	green ash, yellow-
							Black walnut	---	---	poplar.
424E2**, 424F2**, 424F3**:										
Lindley	3R	Moderate	Moderate	Slight	Slight	Severe	White oak	56	3	White oak, northern
							Northern red oak	61	3	red oak, black oak.
							Black oak	63	3	
Keswick	3R	Moderate	Moderate	Moderate	Severe	Slight	White oak	55	3	Eastern white pine,
							Northern red oak	55	3	red pine, sugar maple.

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*	
429D2**:										
Downs	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	---	---	
Lamont	3A	Slight	Slight	Slight	Slight	Moderate	Northern red oak	55	3	Eastern white pine.
							White oak	55	3	
429E2**:										
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	---	---	
Lamont	3R	Moderate	Moderate	Slight	Slight	Moderate	Northern red oak	55	3	Eastern white pine.
							White oak	55	3	
429E3**:										
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	---	---	
Lamont	3R	Moderate	Moderate	Slight	Slight	Moderate	Northern red oak	55	3	Eastern white pine.
							White oak	55	3	
429F2**:										
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	---	---	
Lamont	3R	Moderate	Moderate	Slight	Slight	Moderate	Northern red oak	55	3	Eastern white pine.
							White oak	55	3	
430, 430B---------- Ackmore	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Eastern white pine, red pine, cottonwood, sugar maple, black walnut.
462B, 462C--------- Downs	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	---	---	

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*	
478G**:										
Emeline	2R	Moderate	Severe	Severe	Severe	Slight	Black oak	50	2	Eastern redcedar, eastern white pine, red pine, jack pine, bur oak.
							Bur oak	50	2	
							Eastern redcedar	50	4	
							Shagbark hickory	50	---	
							Northern red oak	50	2	
							American elm	50	---	
Rock outcrop.										
484	2A	Slight	Slight	Slight	Slight	Severe	Silver maple	70	2	White spruce, silver maple, white ash.
Lawson							White ash	---	---	
							Red maple	---	---	
673D2, 673D3	4A	Slight	Slight	Slight	Slight	Moderate	White oak	70	4	Eastern white pine, red pine, Scotch pine, white oak.
Timula							Northern red oak	---	---	
							Green ash	---	---	
							Bur oak	---	---	
673E2, 673E3, 673F2, 673F3, 673G	4R	Moderate	Moderate	Moderate	Slight	Moderate	White oak	70	4	Eastern white pine, red pine, Scotch pine, white oak.
Timula							Northern red oak	---	---	
							Green ash	---	---	
							Bur oak	---	---	
771B, 771C, 771C2, 771D2	4A	Slight	Slight	Slight	Slight	Moderate	White oak	75	4	Eastern white pine, red pine, black walnut, sugar maple.
Waubeek							Northern red oak	---	4	
926	3A	Slight	Slight	Slight	Slight	Slight	White oak	65	3	Eastern white pine, red pine, sugar maple, cottonwood.
Canoe							Northern red oak	65	3	
933B	5W	Slight	Moderate	Moderate	Moderate	Severe	Pin oak	90	5	American sycamore, black spruce, hackberry, European larch, green ash, pin oak, red maple, swamp white oak.
Sawmill							Eastern cottonwood	---	---	
							Sweetgum	---	---	
							Cherrybark oak	---	---	
							American sycamore	---	---	
978	3A	Slight	Slight	Slight	Slight	Moderate	White oak	65	3	Eastern white pine, red pine, black walnut, sugar maple.
Festina							Northern red oak	65	3	

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*	
993E2**:										
Gara	3R	Moderate	Moderate	Slight	Slight	Slight	White oak	55	3	Eastern white pine, red pine, white oak, northern red oak.
							Northern red oak	55	3	
Armstrong	3R	Moderate	Moderate	Moderate	Severe	Slight	White oak	55	3	Eastern white pine, red pine, European larch, sugar maple.
							Northern red oak	55	3	
993E3**:										
Gara	3R	Moderate	Moderate	Slight	Slight	Slight	White oak	55	3	Eastern white pine, red pine, white oak.
							Northern red oak	55	3	
Armstrong	3R	Moderate	Moderate	Moderate	Severe	Slight	White oak	55	3	Eastern white pine, red pine, European larch, sugar maple.
							Northern red oak	55	3	

* 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
5B*:					
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.
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.
7, 7B Wiota	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
8B Judson	---	Amur honeysuckle, Amur maple, autumn-olive, lilac.	Hackberry, bur oak, green ash, Russian-olive, eastern redcedar.	Honeylocust, Austrian pine, eastern white pine.	---
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, 20D2, 20D3, 20E2, 20E3 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.

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
24D2, 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.
43---------- Bremer	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, blue spruce, white fir, northern whitecedar, Washington hawthorn.	Eastern white pine	Pin oak.
63D, 63F---------- Chelsea	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac.	Austrian pine, jack pine, red pine.	Eastern white pine	---
65D2, 65E2, 65E3, 65F, 65F2, 65F3, 65G---------- Lindley	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern whitecedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
83B, 83C2---------- 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.
88---------- Nevin	---	Silky dogwood, Amur privet, American cranberrybush, Amur honeysuckle.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
110C---------- Lamont	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush.	Austrian pine, eastern redcedar, northern whitecedar, Osage-orange.	Eastern white pine, Norway spruce, red 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
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.
120, 120B, 120B2, 120C, 120C2, 120C3, 120D2, 120D3, 120E2----- 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.
122---------- Sperry	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
133, 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.
134---------- 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.
162B, 162C, 162C2, 162D, 162D2, 162D3, 162E2, 162E3, 162F, 162F2, 162F3----- 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.

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
163B, 163C, 163C2, 163D, 163D2, 163D3, 163E, 163E2, 163E3, 163F, 163F2--- 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.
163F3--- Fayette	---	Redosier dogwood, Siberian peashrub, gray dogwood, lilac.	Northern whitecedar, hackberry, Russian-olive, blue spruce, Amur maple, eastern redcedar.	Eastern white pine, green ash.	---
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.
164--- Traer	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, blue spruce, white fir, northern whitecedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
174B, 174C--- Bolan	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
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, 179D3, 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.

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
220---------- 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.
222D2---------- Clarinda	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Green ash, Osage-orange.	Eastern white pine, pin oak, Austrian pine.	---
226---------- 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.
269---------- Humeston	---	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.
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.
293D*, 293D2*, 293E*, 293E2*, 293F*, 293F2*, 293G*:					
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.	---

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
293D*, 293D2*, 293E*, 293E2*, 293F*, 293F2*, 293G*: 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.
350, 350B, 350C---Waukegan	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, 377B2, 377C, 377C2, 377D2, 377D3---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.
420B, 420C---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.
424E2*, 424F2*, 424F3*: Lindley	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern whitecedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
Keswick	---	Eastern redcedar, American cranberrybush, Washington hawthorn, arrowwood, Amur privet, Amur honeysuckle.	Austrian pine, green ash, Osage-orange.	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.

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
429D2*, 429E2*, 429E3*, 429F2*: 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.
Lamont	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush.	Austrian pine, eastern redcedar, northern whitecedar, Osage-orange.	Eastern white pine, Norway spruce, red pine.	---
430 Ackmore	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, white fir, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
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.
462B, 462C 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.
478G*: Emeline.					
Rock outcrop.					
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.
485 Spillville	---	Amur honeysuckle, Amur privet, silky dogwood, American cranberrybush.	Austrian pine, white fir, blue spruce, Washington hawthorn, northern whitecedar.	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
673D2, 673D3, 673E2, 673E3, 673F2, 673F3, 673G---------- Timula	---	Osage-orange, Russian-olive, eastern redcedar, Washington hawthorn.	Honeylocust, northern catalpa, green ash.	---	---
683C2, 683D2, 683D3, 683E2, 683E3---------- Liscomb	---	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.
771B, 771C, 771C2, 771D2---------- Waubeek	---	American cranberrybush, Amur privet, Amur honeysuckle, silky dogwood.	Northern whitecedar, blue spruce, Washington hawthorn, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
926---------- Canoe	---	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.
933B---------- Sawmill	---	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.
978---------- Festina	---	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.
993E2*, 993E3*: 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.
Armstrong--------	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, American cranberrybush, Amur honeysuckle.	Austrian pine, green ash, Osage-orange.	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
1133---------- 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.
1220---------- 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.
1485---------- Spillville	---	Amur honeysuckle, Amur privet, silky dogwood, American cranberrybush.	Austrian pine, white fir, blue spruce, Washington hawthorn, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.
5010*, 5030*. Pits					
5040*, 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
5B*:					
Ackmore	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
Colo	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
7 Wiota	Slight	Slight	Slight	Slight	Slight.
7B Wiota	Slight	Slight	Moderate: slope.	Slight	Slight.
8B Judson	Slight	Slight	Moderate: slope.	Slight	Slight.
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.
20D2 Killduff	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
20D3 Killduff	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
20E2 Killduff	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
20E3 Killduff	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
24D2 Shelby	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	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.

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
43 Bremer	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
63D Chelsea	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
63F Chelsea	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
65D2 Lindley	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
65E2, 65E3, 65F, 65F2, 65F3 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.
88 Nevin	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
110C Lamont	Slight	Slight	Severe: slope.	Slight	Slight.
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.
120 Tama	Slight	Slight	Slight	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.

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
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.
122---------- Sperry	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
133, 133+---------- Colo	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
134---------- Zook	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
162B---------- Downs	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
162C, 162C2---------- Downs	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
162D, 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.
162F, 162F2---------- Downs	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
162F3---------- Downs	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
163B---------- Fayette	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
163C---------- Fayette	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
163C2---------- 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.

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
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.
164---------- Traer	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
174B---------- Bolan	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
174C---------- Bolan	Slight----------	Slight----------	Severe: slope.	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.
179D3---------- Gara	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	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.
220---------- Nodaway	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
222D2---------- Clarinda	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
226---------- Lawler	Moderate: wetness.	Moderate: wetness.	Moderate: 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
269--Humeston	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
291--Atterberry	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
293D*:					
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.
293D2*:					
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.	Severe: erodes easily.	Moderate: slope.
293E*:					
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.
293E2*:					
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.	Severe: erodes easily.	Severe: 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.

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
293F*:					
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
293F2*:					
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.	Severe: erodes easily.	Severe: slope.
293G*:					
Chelsea	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lamont	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
350 Waukegan	Slight	Slight	Slight	Slight	Slight.
350B Waukegan	Slight	Slight	Moderate: slope.	Slight	Slight.
350C Waukegan	Slight	Slight	Severe: slope.	Slight	Slight.
354* Aquolls	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
377B, 377B2 Dinsdale	Slight	Slight	Moderate: slope.	Slight	Slight.
377C, 377C2 Dinsdale	Slight	Slight	Severe: slope.	Slight	Slight.
377D2, 377D3 Dinsdale	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
420B Tama	Slight	Slight	Moderate: slope.	Slight	Slight.
420C Tama	Slight	Slight	Severe: slope.	Slight	Slight.
424E2*, 424F2*, 424F3*:					
Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Keswick	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: erodes easily.	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
428B Ely	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
429D2*: Downs	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Lamont	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
429E2*: Downs	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Lamont	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
429E3*: Downs	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Lamont	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
429F2*: Downs	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Lamont	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
430 Ackmore	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
430B Ackmore	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
462B Downs	Slight	Slight	Moderate: slope.	Slight	Slight.
462C Downs	Slight	Slight	Severe: slope.	Slight	Slight.
478G*: Emeline	Severe: slope, percs slowly, depth to rock.	Severe: slope, percs slowly, depth to rock.	Severe: slope, depth to rock, percs slowly.	Severe: slope.	Severe: slope, depth to rock.
Rock outcrop.					
484 Lawson	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
485 Spillville	Severe: flooding.	Slight	Moderate: 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
673D2, 673D3---------- Timula	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
673E2, 673E3, 673F2, 673F3---------- Timula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
673G---------- Timula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
683C2---------- Liscomb	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
683D2---------- Liscomb	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
683D3---------- Liscomb	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
683E2---------- Liscomb	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
683E3---------- Liscomb	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
771B---------- Waubeek	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
771C, 771C2---------- Waubeek	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
771D2---------- Waubeek	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
926---------- Canoe	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Slight----------	Slight.
933B---------- Sawmill	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
978---------- Festina	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
993E2*:					
Gara----------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Armstrong----------	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Moderate: wetness, slope.	Severe: slope.
993E3*:					
Gara----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Armstrong----------	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: erodes easily.	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
1133---------- Colo	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
1220---------- Nodaway	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
1485---------- Spillville	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
5010*, 5030*. Pits					
5040*, 5080*---------- Orthents	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope.	Slight----------	Slight.

* 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
5B*:										
Ackmore	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Colo	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
7, 7B---------- Wiota	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
8B---------- Judson	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
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---------- 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.
20E2, 20E3--------- Killduff	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
24D2, 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.
43---------- Bremer	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
63D, 63F---------- Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
65D2---------- Lindley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
65E2, 65E3, 65F, 65F2, 65F3-------- 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---------- Kenyon	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
88---------- Nevin	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.

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
110C---------- Lamont	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
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.
120, 120B, 120B2--- Tama	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
120C, 120C2, 120C3, 120D2, 120D3, 120E2---------- Tama	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
122---------- Sperry	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
133, 133+---------- Colo	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
134---------- Zook	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
162B---------- Downs	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
162C---------- Downs	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
162C2---------- Downs	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
162D---------- Downs	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
162D2, 162D3------- Downs	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
162E2, 162E3, 162F, 162F2, 162F3------ Downs	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
163B---------- Fayette	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
163C---------- Fayette	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
163C2---------- 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.

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
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.
164---- Traer	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
174B---- Bolan	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
174C---- Bolan	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
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.
179D2, 179D3---- 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.
220---- Nodaway	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
222D2---- Clarinda	Poor	Fair	Poor	Fair	Poor	Poor	Poor	Fair	Fair	Poor.
226---- Lawler	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
269---- Humeston	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
291---- Atterberry	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
293D*:										
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.
293D2*:										
Chelsea----	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	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
293D2*:										
Lamont	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Fayette	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
293E*, 293E2*, 293F*, 293F2*:										
Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Lamont	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Fayette	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
293G*:										
Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Lamont	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Fayette	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
350, 350B Waukegan	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
350C Waukegan	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
354*. Aquolls										
377B, 377B2 Dinsdale	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
377C, 377C2, 377D2, 377D3 Dinsdale	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
420B Tama	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
420C Tama	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
424E2*:										
Lindley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Keswick	Poor	Fair	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
424F2*, 424F3*:										
Lindley	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
424F2*, 424F3*: Keswick	Very poor.	Poor	Fair	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
428B---- Ely	Good	Good	Good	Good	Good	Fair	Very poor.	Good	Good	Poor.
429D2*: Downs	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Lamont	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
429E2*, 429E3*, 429F2*: Downs	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Lamont	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
430, 430B---- Ackmore	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
462B---- Downs	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
462C---- Downs	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
478G*: Emeline	Very poor.	Very poor.	Poor	Fair	Fair	Very poor.	Very poor.	Very poor.	Fair	Very poor.
Rock outcrop.										
484---- Lawson	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
485---- Spillville	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
673D2, 673D3---- Timula	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
673E2, 673E3, 673F2, 673F3---- Timula	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
673G---- Timula	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
683C2---- Liscomb	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
683D2, 683D3---- Liscomb	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
683E2, 683E3---- Liscomb	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
771B---- Waubeek	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
771C, 771C2, 771D2- Waubeek	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
926---- Canoe	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
933B---- Sawmill	Good	Good	Good	Fair	Fair	Good	Fair	Good	Fair	Fair.
978---- Festina	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
993E2*, 993E3*:										
Gara----	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Armstrong----	Poor	Fair	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
1133---- Colo	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
1220---- Nodaway	Poor	Fair	Fair	Poor	Poor	Good	Fair	Poor	Poor	Fair.
1485---- Spillville	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
5010*, 5030*. Pits										
5040*, 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
5B*:						
Ackmore	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
Colo	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
7, 7B Wiota	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
8B Judson	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
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 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.
20E2, 20E3 Killduff	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
24D2, 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.
43 Bremer	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Moderate: wetness, flooding.

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
63D---------- Chelsea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
63F---------- Chelsea	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
65D2---------- Lindley	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
65E2, 65E3, 65F, 65F2, 65F3, 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.
83C2---------- Kenyon	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength, frost action.	Slight.
88---------- Nevin	Severe: excess humus, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Slight.
110C---------- Lamont	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
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.
120, 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---------- Tama	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, 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
122--Sperry	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
133, 133+--Colo	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
134--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, too clayey.
162B--Downs	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
162C, 162C2--Downs	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
162D, 162D2, 162D3--Downs	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
162E2, 162E3, 162F, 162F2, 162F3--Downs	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
163B--Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
163C, 163C2--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.
164--Traer	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.

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
174B---------- Bolan	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
174C---------- Bolan	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
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, 179D3------ 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.
220---------- Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
222D2---------- Clarinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
226---------- Lawler	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Slight.
269---------- Humeston	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.
291---------- Atterberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
293D*, 293D2*: 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----------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: 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
293E*, 293E2*, 293F*, 293F2*, 293G*:						
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: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
350, 350B--------- Waukegan	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Severe: low strength.	Slight.
350C--------- Waukegan	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: 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.
377B2--------- Dinsdale	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	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.
377D2, 377D3------ Dinsdale	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
420B--------- Tama	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
420C--------- Tama	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
424E2*, 424F2*, 424F3*:						
Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, 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
424E2*, 424F2*, 424F3*:						
Keswick	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
428B Ely	Severe: excess humus, wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
429D2*:						
Downs	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Lamont	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
429E2*, 429E3*, 429F2*:						
Downs	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Lamont	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
430 Ackmore	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
430B Ackmore	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
462B Downs	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
462C Downs	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
478G*:						
Emeline	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop.						
484 Lawson	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.

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
485--- Spillville	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
673D2, 673D3--- Timula	Moderate: cutbanks cave, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
673E2, 673E3, 673F2, 673F3, 673G--- Timula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
683C2--- Liscomb	Slight---	Slight---	Slight---	Moderate: slope.	Moderate: low strength, frost action.	Slight.
683D2, 683D3--- Liscomb	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
683E2, 683E3--- Liscomb	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
771B--- Waubeek	Slight---	Moderate: shrink-swell.	Slight---	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
771C, 771C2--- Waubeek	Slight---	Moderate: shrink-swell.	Slight---	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
771D2--- Waubeek	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	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.
933B--- Sawmill	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness.	Severe: wetness.
978--- Festina	Slight---	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
993E2*, 993E3*: Gara---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Armstrong---	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: wetness, slope, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.

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
1133-------------- Colo	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Severe: flooding.
1220-------------- Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Severe: flooding.
1485-------------- Spillville	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
5010*, 5030*. Pits						
5040*, 5080*------ Orthents	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Slight.

* 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
5B*:					
Ackmore	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Colo	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
7 Wiota	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
7B Wiota	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
8B Judson	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
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.
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.
20E2, 20E3 Killduff	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
24D2, 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.
43 Bremer	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.

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
63D---------- Chelsea	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
63F---------- Chelsea	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
65D2---------- Lindley	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
65E2, 65E3, 65F, 65F2, 65F3, 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.
83C2---------- Kenyon	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
88---------- Nevin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
110C---------- Lamont	Slight----------	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
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.
120---------- Tama	Slight----------	Moderate: seepage.	Moderate: too clayey.	Slight----------	Fair: too clayey.
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---------- Tama	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
122---------- Sperry	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.

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
133, 133+---------- Colo	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
134---------- Zook	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
162B---------- Downs	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
162C, 162C2--------- Downs	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
162D, 162D2, 162D3-- Downs	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
162E2, 162E3, 162F, 162F2, 162F3------- Downs	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
163B---------- Fayette	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
163C, 163C2--------- 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.
164---------- Traer	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
174B---------- Bolan	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
174C---------- Bolan	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
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.

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
179D2, 179D3-------- 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.
220---------- Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
222D2---------- Clarinda	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
226---------- Lawler	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
269---------- Humeston	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
291---------- Atterberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
293D*, 293D2*: Chelsea---------- Lamont---------- Fayette----------	Severe: poor filter. Moderate: slope. Moderate: percs slowly, slope.	Severe: seepage, slope. Severe: seepage, slope. Severe: slope.	Severe: seepage, too sandy. Severe: seepage. Moderate: slope, too clayey.	Severe: seepage. Severe: seepage. Moderate: slope.	Poor: seepage, too sandy. Fair: slope, thin layer. Fair: too clayey, slope.
293E*, 293E2*, 293F*, 293F2*, 293G*: Chelsea---------- Lamont---------- Fayette----------	Severe: poor filter, slope. Severe: slope. Severe: slope.	Severe: seepage, slope. Severe: seepage, slope. Severe: slope.	Severe: seepage, slope, too sandy. Severe: seepage, slope. Severe: slope.	Severe: seepage, slope. Severe: seepage, slope. Severe: slope.	Poor: seepage, too sandy, slope. Poor: slope. Poor: 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
350, 350B Waukegan	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
350C Waukegan	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, 377B2 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.
377D2, 377D3 Dinsdale	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
420B Tama	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
420C Tama	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
424E2*, 424F2*, 424F3*:					
Lindley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Keswick	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness, slope.	Severe: wetness, slope.	Poor: slope, wetness.
428B Ely	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
429D2*:					
Downs	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Lamont	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope, thin layer.
429E2*, 429E3*, 429F2*:					
Downs	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Lamont	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: 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
430, 430B---------- Ackmore	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
462B---------- Downs	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
462C---------- Downs	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
478G*: Emeline---------- Rock outcrop.	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
484---------- Lawson	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
485---------- Spillville	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Fair: wetness.
673D2, 673D3-------- Timula	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
673E2, 673E3, 673F2, 673F3, 673G-------- Timula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
683C2---------- Liscomb	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
683D2, 683D3-------- Liscomb	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
683E2, 683E3-------- Liscomb	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
771B---------- Waubeek	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
771C, 771C2--------- Waubeek	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
771D2---------- Waubeek	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
926---------- Canoe	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.

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
933B---------- Sawmill	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
978---------- Festina	Slight----------	Moderate: seepage.	Severe: seepage.	Slight----------	Fair: too clayey.
993E2*, 993E3*: Gara----------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Armstrong----------	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness, slope, too clayey.	Severe: wetness, slope.	Poor: too clayey, hard to pack, slope.
1133---------- Colo	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
1220---------- Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
1485---------- Spillville	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Fair: wetness.
5010*, 5030*. Pits					
5040*, 5080*-------- Orthents	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.

* 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
5B*:				
Ackmore	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Colo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
7, 7B Wiota	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
8B Judson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
11B*:				
Colo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ely	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
20C2 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.
20E2, 20E3 Killduff	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
24D2, 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.
43 Bremer	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
63D Chelsea	Good	Probable	Improbable: too sandy.	Poor: too sandy.
63F Chelsea	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
65D2 Lindley	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
65E2, 65E3, 65F, 65F2, 65F3 Lindley	Fair: slope, shrink-swell.	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.
88 Nevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
110C Lamont	Good	Probable	Improbable: too sandy.	Fair: too clayey.
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.
120, 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 Tama	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
122 Sperry	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
133, 133+ Colo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
134 Zook	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
162B, 162C, 162C2 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
162D, 162D2, 162D3---- Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
162E2, 162E3, 162F, 162F2, 162F3--------- Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
163B, 163C, 163C2----- 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.
163G------------------ Fayette	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
164------------------- Traer	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
174B, 174C------------ Bolan	Good----------	Probable----------	Improbable: too sandy.	Fair: thin layer.
175B, 175C------------ Dickinson	Good----------	Probable----------	Improbable: too sandy.	Fair: thin layer.
179D2, 179D3---------- 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.
220------------------- Nodaway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
222D2----------------- Clarinda	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
226------------------- Lawler	Fair: wetness.	Probable----------	Probable----------	Poor: area reclaim.
269------------------- Humeston	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
291------------------- Atterberry	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
293D*, 293D2*:				
Chelsea	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Lamont	Good	Probable	Improbable: too sandy.	Fair: too clayey, slope.
Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
293E*, 293E2*, 293F*, 293F2*:				
Chelsea	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Lamont	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
293G*:				
Chelsea	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Lamont	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope.
Fayette	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
350, 350B, 350C--- Waukegan	Good	Probable	Improbable: too sandy.	Fair: small stones, area reclaim.
354*--- Aquolls	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
377B--- Dinsdale	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
377B2--- Dinsdale	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
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.
377D2, 377D3--- Dinsdale	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
420B, 420C--- Tama	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
424E2*, 424F2*, 424F3*:				
Lindley	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Keswick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
428B---- Ely	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
429D2*:				
Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Lamont	Good	Probable	Improbable: too sandy.	Fair: too clayey, slope.
429E2*, 429E3*, 429F2*:				
Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Lamont	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
430---- Ackmore	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
430B---- Ackmore	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
462B, 462C---- Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
478G*:				
Emeline	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Rock outcrop.				
484---- Lawson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
485---- Spillville	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
673D2, 673D3---- Timula	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
673E2, 673E3, 673F2, 673F3---- Timula	Fair: slope.	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
673G Timula	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
683C2 Liscomb	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
683D2, 683D3 Liscomb	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
683E2, 683E3 Liscomb	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
771B, 771C Waubeek	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
771C2 Waubeek	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
771D2 Waubeek	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
926 Canoe	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
933B Sawmill	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
978 Festina	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
993E2*, 993E3*:				
Gara	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Armstrong	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
1133 Colo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1220 Nodaway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
1485 Spillville	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
5010*, 5030*. Pits				
5040*, 5080* Orthents	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

* 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
5B*:						
Ackmore	Moderate: seepage, slope.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action, slope.	Wetness	Wetness.
Colo	Moderate: seepage, slope.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action, slope.	Wetness	Wetness.
7 Wiota	Moderate: seepage.	Slight	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
7B Wiota	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
8B Judson	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
11B*:						
Colo	Moderate: seepage, slope.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action, slope.	Wetness	Wetness.
Ely	Moderate: seepage, slope.	Moderate: piping, wetness.	Moderate: deep to water, slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
20C2 Killduff	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
20D2, 20D3, 20E2, 20E3 Killduff	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
24D2 Shelby	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope.
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.
43 Bremer	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
63D, 63F---------- Chelsea	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
65D2, 65E2, 65E3, 65F, 65F2, 65F3, 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.
88---------- Nevin	Moderate: seepage.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action---	Erodes easily, wetness.	Erodes easily.
110C---------- Lamont	Severe: seepage.	Moderate: thin layer.	Severe: no water.	Deep to water	Soil blowing---	Favorable.
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.
120---------- Tama	Moderate: seepage.	Slight---------	Severe: no water.	Deep to water	Erodes easily	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---------- Tama	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
122---------- Sperry	Slight---------	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Erodes easily, ponding.	Wetness, erodes easily, percs slowly.
133, 133+--------- Colo	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness--------	Wetness.
134---------- Zook	Slight---------	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Wetness, percs slowly.
162B, 162C, 162C2- Downs	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
162D, 162D2, 162D3, 162E2, 162E3, 162F, 162F2, 162F3----- Downs	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
163B, 163C, 163C2- 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.
164---------- Traer	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
174B, 174C-------- Bolan	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy------	Favorable.
175B, 175C-------- Dickinson	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Favorable.
179D2---------- Gara	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope----------	Slope, rooting depth.
179D3---------- Gara	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.
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.
220---------- Nodaway	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Erodes easily	Erodes easily.
222D2---------- Clarinda	Severe: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
226---------- Lawler	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, too sandy.	Rooting depth.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
269---------- Humeston	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
291---------- Atterberry	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
293D*, 293D2*, 293E*, 293E2*, 293F*, 293F2*, 293G*:						
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: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
350, 350B, 350C--- Waukegan	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily, too sandy.	Erodes easily.
354*---------- Aquolls	Slight---------	Severe: ponding.	Slight---------	Ponding--------	Ponding--------	Wetness.
377B---------- Dinsdale	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily, rooting depth.
377B2---------- Dinsdale	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Erodes easily	Erodes easily, rooting depth.
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.
377D2, 377D3------ Dinsdale	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.
420B, 420C-------- Tama	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
424E2*, 424F2*, 424F3*:						
Lindley---------	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope----------	Slope.
Keswick---------	Severe: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
428B---------- Ely	Moderate: seepage, slope.	Moderate: piping, wetness.	Moderate: deep to water, slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
429D2*, 429E2*, 429E3*, 429F2*: Downs----------	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Lamont----------	Severe: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope.
430---------- Ackmore	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
430B---------- Ackmore	Moderate: seepage, slope.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action, slope.	Wetness--------	Wetness.
462B, 462C-------- Downs	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
478G*: Emeline----------	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock, percs slowly.
Rock outcrop.						
484---------- Lawson	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
485---------- Spillville	Severe: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Favorable------	Favorable.
673D2, 673D3, 673E2, 673E3, 673F2, 673F3, 673G---------- Timula	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
683C2---------- Liscomb	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
683D2, 683D3, 683E2, 683E3----- Liscomb	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
771B, 771C, 771C2- Waubeek	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily, rooting depth.
771D2---------- Waubeek	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.

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.
933B---------- Sawmill	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action---	Wetness--------	Wetness.
978---------- Festina	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
993E2*:						
Gara----------	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope----------	Slope, rooting depth.
Armstrong--------	Severe: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Wetness, slope, percs slowly.
993E3*:						
Gara----------	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.
Armstrong--------	Severe: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
1133---------- Colo	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness--------	Wetness.
1220---------- Nodaway	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Erodes easily	Erodes easily.
1485---------- Spillville	Severe: seepage.	Moderate: thin layer, piping, wetness.	Moderate: deep to water, slow refill.	Deep to water	Favorable------	Favorable.
5010*, 5030*. Pits						
5040*, 5080*------ Orthents	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Favorable------	Favorable.

* 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		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
5B*:											
Ackmore	0-27	Silt loam	CL, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	8-20
	27-60	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	8-20
Colo	0-14	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-60	15-30
	14-46	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-55	20-30
	46-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	80-100	40-55	15-30
7, 7B Wiota	0-18	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	100	90-95	25-35	5-15
	18-49	Silty clay loam	CL	A-7	0	100	100	95-100	90-95	40-50	15-25
	49-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	95-100	90-95	30-50	15-30
8B Judson	0-36	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	100	95-100	35-50	10-25
	36-50	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	30-50	15-25
	50-60	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-7, A-4	0	100	100	100	95-100	25-50	5-25
11B*:											
Colo	0-14	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-60	15-30
	14-46	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-55	20-30
	46-60	Silty 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
	29-44	Silty clay loam	CL, ML	A-7, A-6	0	100	100	95-100	95-100	35-50	10-25
	44-60	Silt loam, silty clay loam.	CL	A-6	0	100	100	90-100	85-100	25-40	10-20
20C2, 20D2, 20D3, 20E2, 20E3 Killduff	0-7	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	35-50	15-25
	7-29	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	29-60	Silt loam, silty clay loam.	CL	A-6	0	100	100	100	95-100	30-40	10-20
24D2 Shelby	0-8	Loam	CL	A-6, A-7	0	90-95	85-95	75-90	55-70	35-45	15-25
	8-42	Clay loam	CL	A-6, A-7	0	90-95	85-95	75-90	55-70	35-45	15-25
	42-60	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
24D3 Shelby	0-8	Clay loam	CL	A-6, A-7	0	90-95	85-95	75-90	55-70	35-45	15-25
	8-42	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
	42-60	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
24E2 Shelby	0-8	Loam	CL	A-6, A-7	0	90-95	85-95	75-90	55-70	35-45	15-25
	8-42	Clay loam	CL	A-6, A-7	0	90-95	85-95	75-90	55-70	35-45	15-25
	42-60	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
24E3 Shelby	0-8	Clay loam	CL	A-6, A-7	0	90-95	85-95	75-90	55-70	35-45	15-25
	8-42	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
	42-60	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
43----------	0-18	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	45-60	25-40
Bremer	18-41	Silty clay loam, silty clay.	CH, MH	A-7	0	100	100	100	95-100	50-65	20-35
	41-60	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	40-60	25-40
63D----------	0-12	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-95	10-35	---	NP
Chelsea	12-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-95	3-15	---	NP
63F----------	0-12	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-95	10-35	---	NP
Chelsea	12-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-95	3-15	---	NP
65D2, 65E2-------	0-6	Loam----------	CL	A-6	0	95-100	90-100	85-95	50-65	25-35	10-15
Lindley	6-42	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	12-20
	42-60	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	50-70	25-35	10-15
65E3----------	0-6	Clay loam--------	CL	A-6	0	95-100	90-100	85-95	55-75	30-40	15-20
Lindley	6-42	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	12-20
	42-60	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	50-70	25-35	10-15
65F, 65F2--------	0-6	Loam----------	CL	A-6	0	95-100	90-100	85-95	50-65	25-35	10-15
Lindley	6-42	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	12-20
	42-60	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	50-70	25-35	10-15
65F3----------	0-6	Clay loam--------	CL	A-6	0	95-100	90-100	85-95	55-75	30-40	15-20
Lindley	6-42	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	12-20
	42-60	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	50-70	25-35	10-15
65G----------	0-6	Loam----------	CL	A-6	0	95-100	90-100	85-95	50-65	25-35	10-15
Lindley	6-42	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	12-20
	42-60	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	50-70	25-35	10-15
83B, 83C2--------	0-13	Loam----------	CL	A-6	0	100	95-100	85-95	65-75	30-40	10-20
Kenyon	13-46	Loam, clay loam, sandy clay loam.	CL	A-6	0-5	90-95	85-95	80-90	50-65	30-40	10-20
	46-60	Loam----------	CL	A-6	0-5	90-95	85-95	80-90	50-65	25-35	10-20
88----------	0-22	Silty clay loam	CL, OL	A-6, A-7	0	100	100	100	90-95	35-45	10-20
Nevin	22-46	Silty clay loam	CL	A-7	0	100	100	95-100	90-95	40-50	20-30
	46-60	Silty clay loam, silt loam.	CL	A-7	0	100	100	95-100	90-95	40-50	20-30
110C----------	0-8	Fine sandy loam	SC-SM, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
Lamont	8-14	Fine sandy loam, loamy fine sand.	SM, SC-SM	A-2, A-4	0	100	100	80-95	15-50	<25	NP-5
	14-43	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
	43-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	70-90	5-25	---	NP
118----------	0-23	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	45-55	20-30
Garwin	23-52	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	45-55	25-35
	52-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	15-20
119----------	0-22	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
Muscatine	22-47	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 inches	4	10	40	200		
	In				Pct					Pct	
119B	0-22	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
Muscatine	22-47	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	20-30
	47-50	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
120, 120B	0-14	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	14-45	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	45-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
120B2	0-7	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	7-14	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
	14-45	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	45-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
120C	0-14	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	14-45	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	45-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
120C2	0-7	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	7-14	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
	14-45	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	45-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
120C3	0-6	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	6-33	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	33-60	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	7-14	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
	14-45	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	45-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
120D3	0-6	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	6-33	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	33-60	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	7-14	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
	14-45	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	45-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
122	0-7	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
Sperry	7-13	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
	13-46	Silty clay loam, silty clay.	CH	A-7	0	100	100	100	95-100	50-65	25-35
	46-60	Silty clay loam, silt loam.	CL	A-7	0	100	100	100	95-100	40-50	20-30
133	0-14	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-60	15-30
Colo	14-46	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-55	20-30
	46-60	Silty clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	80-100	40-55	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 inches	4	10	40	200		
	In				Pct					Pct	
133+	0-12	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	25-40	5-15
Colo	12-48	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-55	20-30
	48-60	Silty clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	80-100	40-55	15-30
134	0-39	Silty clay	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
Zook	39-60	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
162B, 162C	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Downs	7-49	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
	49-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
162C2	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Downs	7-49	Silty clay loam, silt loam.	CL	A-7, A-8	0	100	100	100	95-100	35-45	15-25
	49-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
162D	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Downs	7-49	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
	49-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
162D2	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Downs	7-49	Silty clay loam, silt loam.	CL	A-7, A-8	0	100	100	100	95-100	35-45	15-25
	49-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
162D3	0-3	Silty clay loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
Downs	3-42	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
	42-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
162E2	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Downs	7-49	Silty clay loam, silt loam.	CL	A-7, A-8	0	100	100	100	95-100	35-45	15-25
	49-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
162E3	0-3	Silty clay loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
Downs	3-42	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
	42-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
162F	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Downs	7-49	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
	49-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
162F2	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Downs	7-49	Silty clay loam, silt loam.	CL	A-7, A-8	0	100	100	100	95-100	35-45	15-25
	49-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
162F3	0-3	Silty clay loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
Downs	3-42	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
	42-60	Silt loam	CL	A-6	0	100	100	100	95-100	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		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
163B---------- Fayette	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	6-42	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	42-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163C---------- Fayette	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	6-54	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	54-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163C2---------- Fayette	0-6	Silt loam--------	CL	A-6, A-7	0	100	100	100	95-100	30-45	10-25
	6-42	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	42-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163D---------- Fayette	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	6-42	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	42-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163D2---------- Fayette	0-6	Silt loam--------	CL	A-6, A-7	0	100	100	100	95-100	30-45	10-25
	6-42	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	42-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163D3---------- Fayette	0-3	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	3-38	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	38-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163E---------- Fayette	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	6-42	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	42-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163E2---------- Fayette	0-6	Silt loam--------	CL	A-6, A-7	0	100	100	100	95-100	30-45	10-25
	6-42	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	42-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163E3---------- Fayette	0-3	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	3-38	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	38-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163F---------- Fayette	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	6-42	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	42-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163F2---------- Fayette	0-6	Silt loam--------	CL	A-6, A-7	0	100	100	100	95-100	30-45	10-25
	6-42	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	42-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163F3---------- Fayette	0-3	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	3-38	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	38-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	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 inches	4	10	40	200		
	In				Pct					Pct	
163G----------	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Fayette	6-42	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	42-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
164----------	0-10	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
Traer	10-41	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	41-55	20-30
	41-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	35-40	15-20
174B----------	0-13	Loam----------	CL, ML	A-4, A-6	0	100	100	85-95	50-70	30-40	5-15
Bolan	13-34	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
	34-60	Loamy fine sand, fine sand.	SM, SC-SM, SC	A-4	0	100	100	80-90	35-50	15-25	2-8
174C----------	0-13	Loam----------	CL, ML	A-4, A-6	0	100	100	85-95	50-70	30-40	5-15
Bolan	13-34	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
	34-60	Loamy fine sand, fine sand.	SM, SC-SM, SC	A-4	0	100	100	80-90	35-50	15-25	2-8
175B, 175C-------	0-13	Fine sandy loam	SM, SC, SC-SM	A-4, A-2	0	100	100	85-95	30-50	15-30	NP-10
Dickinson	13-23	Fine sandy loam, sandy loam.	SM, SC, SC-SM	A-4, A-2	0	100	100	85-95	30-50	15-30	NP-10
	23-44	Fine sandy loam, sandy loam.	SM, SC, SC-SM	A-4	0	100	100	85-95	35-50	15-30	NP-10
	44-60	Sand, loamy fine sand, loamy sand.	SM, SP-SM	A-3, A-2	0	100	100	70-90	5-20	---	NP
179D2----------	0-7	Loam, silt loam	CL	A-6, A-7	0	90-95	85-95	70-85	55-75	35-45	15-25
Gara	7-50	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	50-60	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
179D3----------	0-7	Clay loam--------	CL	A-6, A-7	0	90-95	85-95	70-85	55-75	35-45	15-25
Gara	7-45	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	45-60	Loam, clay loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
179E2----------	0-7	Loam, silt loam	CL	A-6, A-7	0	90-95	85-95	70-85	55-75	35-45	15-25
Gara	7-50	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	50-60	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
179E3----------	0-7	Clay loam--------	CL	A-6, A-7	0	90-95	85-95	70-85	55-75	35-45	15-25
Gara	7-45	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	45-60	Loam, clay loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
179F2----------	0-7	Loam, silt loam	CL	A-6, A-7	0	90-95	85-95	70-85	55-75	35-45	15-25
Gara	7-50	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	50-60	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
179F3----------	0-7	Clay loam--------	CL	A-6, A-7	0	90-95	85-95	70-85	55-75	35-45	15-25
Gara	7-45	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	45-60	Loam, clay loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
220----------	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
Nodaway	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-40	5-15

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 inches	4	10	40	200		
	In				Pct					Pct	
222D2----------	0-9	Silty clay loam	CL	A-7	0	100	95-100	90-100	85-100	40-50	20-30
Clarinda	9-47	Silty clay, clay, silty clay loam.	CH	A-7	0	100	95-100	85-100	80-100	55-70	30-40
	47-60	Clay, silty clay, clay loam.	CH	A-7	0	95-100	95-100	80-95	75-90	55-70	35-45
226----------	0-11	Loam----------	CL, ML	A-6, A-7	0	100	90-100	70-90	55-75	35-45	10-20
Lawler	11-35	Loam, sandy clay loam, sandy loam.	CL, SC	A-6	0-5	85-95	80-95	70-85	45-65	25-40	10-20
	35-60	Gravelly coarse sand, sand, loamy coarse sand.	SW, GP, SP, SW-SM	A-1	2-10	50-90	50-85	20-40	3-10	---	NP
269----------	0-16	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	25-40	5-15
Humeston	16-28	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	95-100	95-100	25-40	5-15
	28-60	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	95-100	45-55	25-35
291----------	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	95-100	25-40	5-15
Atterberry	8-14	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	25-35	5-15
	14-44	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0	100	100	95-100	95-100	35-55	15-30
	44-60	Silt loam--------	CL	A-6	0	100	100	95-100	95-100	30-40	10-20
293D*:											
Chelsea----------	0-12	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-95	10-35	---	NP
	12-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-95	3-15	---	NP
Lamont----------	0-8	Sandy loam-------	SC-SM, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	8-14	Fine sandy loam, loamy fine sand.	SM, SC-SM	A-2, A-4	0	100	100	80-95	15-50	<25	NP-5
	14-43	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
	43-60	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
	11-48	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	48-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
293D2*:											
Chelsea----------	0-12	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-95	10-35	---	NP
	12-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-95	3-15	---	NP
Lamont----------	0-8	Sandy loam-------	SC-SM, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	8-14	Fine sandy loam, loamy fine sand.	SM, SC-SM	A-2, A-4	0	100	100	80-95	15-50	<25	NP-5
	14-43	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
	43-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	70-90	5-25	---	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 inches	4	10	40	200		
	In				Pct					Pct	
293D2*:											
Fayette	0-11	Silt loam	CL	A-6, A-7	0	100	100	100	95-100	30-45	10-25
	11-48	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	48-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
293E*:											
Chelsea	0-12	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-95	10-35	---	NP
	12-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-95	3-15	---	NP
Lamont	0-8	Sandy loam	SC-SM, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	8-14	Fine sandy loam, loamy fine sand.	SM, SC-SM	A-2, A-4	0	100	100	80-95	15-50	<25	NP-5
	14-43	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
	43-60	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
	47-73	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
293E2*:											
Chelsea	0-12	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-95	10-35	---	NP
	12-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-95	3-15	---	NP
Lamont	0-8	Sandy loam	SC-SM, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	8-14	Fine sandy loam, loamy fine sand.	SM, SC-SM	A-2, A-4	0	100	100	80-95	15-50	<25	NP-5
	14-43	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
	43-60	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	A-6, A-7	0	100	100	100	95-100	30-45	10-25
	11-47	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	47-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
293F*:											
Chelsea	0-12	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-95	10-35	---	NP
	12-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-95	3-15	---	NP
Lamont	0-8	Sandy loam	SC-SM, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	8-14	Fine sandy loam, loamy fine sand.	SM, SC-SM	A-2, A-4	0	100	100	80-95	15-50	<25	NP-5
	14-43	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
	43-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	70-90	5-25	---	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 inches	4	10	40	200		
	In				Pct					Pct	
293F*:											
Fayette	0-11	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	11-48	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	48-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
293F2*:											
Chelsea	0-12	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-95	10-35	---	NP
	12-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-95	3-15	---	NP
Lamont	0-8	Sandy loam	SC-SM, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	8-14	Fine sandy loam, loamy fine sand.	SM, SC-SM	A-2, A-4	0	100	100	80-95	15-50	<25	NP-5
	14-43	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
	43-60	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	A-6, A-7	0	100	100	100	95-100	30-45	10-25
	11-48	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	48-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
293G*:											
Chelsea	0-12	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-95	10-35	---	NP
	12-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-95	3-15	---	NP
Lamont	0-8	Sandy loam	SC-SM, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	8-14	Fine sandy loam, loamy fine sand.	SM, SC-SM	A-2, A-4	0	100	100	80-95	15-50	<25	NP-5
	14-43	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
	43-60	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
	11-48	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	48-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
350, 350B, 350C--Waukegan	0-12	Silt loam	ML	A-4	0	95-100	95-100	95-100	85-95	25-40	3-10
	12-35	Silt loam, loam	CL-ML, CL	A-4, A-6	0	95-100	95-100	95-100	85-95	25-40	5-15
	35-60	Coarse sand, gravelly sand, loamy sand.	SP, SW, SP-SM	A-1	0-2	80-95	65-85	30-50	3-10	---	NP
354*--Aquolls	0-60	Variable	---	---	---	---	---	---	---	---	---
377B, 377B2, 377C, 377C2, 377D2--Dinsdale	0-20	Silty clay loam	ML, CL	A-6, A-7	0	100	100	100	95-100	35-50	10-20
	20-37	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	37-60	Loam, clay loam, sandy clay 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 inches	4	10	40	200		
	In				Pct					Pct	
377D3----------	0-7	Silty clay loam	ML, CL	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Dinsdale	7-37	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	37-60	Loam, clay loam, sandy clay loam.	CL	A-6	0-5	90-95	85-90	75-85	55-65	25-35	10-20
420B, 420C-------	0-21	Silty clay loam	ML	A-6, A-7	0	100	100	100	95-100	35-50	10-20
Tama	21-45	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	45-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
424E2*:											
Lindley----------	0-6	Silt loam--------	CL	A-6	0	95-100	90-100	85-95	50-65	25-35	10-15
	6-42	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	12-20
	42-60	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	50-70	25-35	10-15
Keswick----------	0-11	Silt loam--------	CL, CL-ML	A-6, A-4	0-5	90-100	80-100	75-90	60-80	20-30	5-15
	11-50	Clay loam, clay, silty clay loam.	CH, CL	A-7	0-5	90-100	80-100	70-90	55-80	40-70	20-40
	50-60	Clay loam--------	CL	A-6	0-5	90-100	80-100	70-90	55-80	30-40	15-25
424F2*:											
Lindley----------	0-6	Loam-------------	CL	A-6	0	95-100	90-100	85-95	50-65	25-35	10-15
	6-42	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	12-20
	42-60	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	50-70	25-35	10-15
Keswick----------	0-11	Loam, silt loam	CL, CL-ML	A-6, A-4	0-5	90-100	80-100	75-90	60-80	20-30	5-15
	11-50	Clay loam, clay, silty clay loam.	CH, CL	A-7	0-5	90-100	80-100	70-90	55-80	40-70	20-40
	50-60	Clay loam--------	CL	A-6	0-5	90-100	80-100	70-90	55-80	30-40	15-25
424F3*:											
Lindley----------	0-6	Clay loam--------	CL	A-6	0	95-100	90-100	85-95	55-75	30-40	15-20
	6-42	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	12-20
	42-60	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	50-70	25-35	10-15
Keswick----------	0-11	Clay loam--------	CL	A-6, A-7	0-5	90-100	80-100	75-90	60-80	35-50	15-25
	11-48	Clay loam, clay	CH, CL	A-7	0-5	90-100	80-100	70-90	55-80	40-70	20-40
	48-60	Clay loam--------	CL	A-6	0-5	90-100	80-100	70-90	55-80	30-40	15-25
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	29-44	Silty clay loam	CL, ML	A-7, A-6	0	100	100	95-100	95-100	35-50	10-25
	44-60	Silt loam, silty clay loam.	CL	A-6	0	100	100	90-100	85-100	25-40	10-20
429D2*, 429E2*:											
Downs----------	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	7-47	Silty clay loam, silt loam.	CL	A-7, A-8	0	100	100	100	95-100	35-45	15-25
	47-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
Lamont----------	0-8	Sandy loam-------	SC-SM, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	8-14	Fine sandy loam, loamy fine sand.	SM, SC-SM	A-2, A-4	0	100	100	80-95	15-50	<25	NP-5
	14-43	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
	43-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	70-90	5-25	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
429E3*:											
Downs	0-7	Silty clay loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
	7-47	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
	47-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
Lamont	0-8	Sandy loam	SC-SM, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	8-14	Fine sandy loam, loamy fine sand.	SM, SC-SM	A-2, A-4	0	100	100	80-95	15-50	<25	NP-5
	14-43	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
	43-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	70-90	5-25	---	NP
429F2*:											
Downs	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	7-47	Silty clay loam, silt loam.	CL	A-7, A-8	0	100	100	100	95-100	35-45	15-25
	47-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
Lamont	0-8	Sandy loam	SC-SM, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	8-14	Fine sandy loam, loamy fine sand.	SM, SC-SM	A-2, A-4	0	100	100	80-95	15-50	<25	NP-5
	14-43	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
	43-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	70-90	5-25	---	NP
430 Ackmore	0-27	Silt loam	CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	8-20
	27-60	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	8-20
430B Ackmore	0-27	Silt loam	CL, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	8-20
	27-60	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	8-20
462B, 462C Downs	0-11	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	11-47	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
	47-60	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
478G*:											
Emeline	0-8	Silt loam	CL	A-6	0-10	85-100	85-100	85-100	70-100	25-40	11-23
	8-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
484 Lawson	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	85-100	20-40	5-20
	7-35	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

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 inches	4	10	40	200		
	In				Pct					Pct	
485--- Spillville	0-45	Loam, silt loam	CL	A-6	0	100	95-100	85-95	60-80	25-40	10-20
	45-60	Sandy clay loam, loam, sandy loam.	CL, CL-ML, SC-SM, SC	A-6, A-4	0	100	95-100	80-90	35-75	20-40	5-15
673D2, 673D3, 673E2, 673E3, 673F2, 673F3, 673G--- Timula	0-6	Silt loam---	ML	A-4	0	100	100	95-100	85-100	25-35	NP-10
	6-60	Silt loam, silt	ML	A-4	0	100	100	95-100	85-100	25-35	NP-10
683C2, 683D2--- Liscomb	0-12	Loam, silt loam	CL	A-6	0	100	100	85-95	60-80	30-40	10-20
	12-45	Loam, sandy clay loam, clay loam.	CL, SC	A-6	0-5	95-100	90-95	85-95	45-70	30-40	10-20
	45-60	Loam, sandy clay loam.	CL, SC	A-6	0-5	95-100	90-95	85-95	45-70	30-40	10-20
683D3--- Liscomb	0-6	Loam---	CL	A-6	0	100	100	85-95	60-80	30-40	10-20
	6-45	Loam, sandy clay loam, clay loam.	CL, SC	A-6	0-5	95-100	90-95	85-95	45-70	30-40	10-20
	45-60	Loam, sandy clay loam.	CL, SC	A-6	0-5	95-100	90-95	85-95	45-70	30-40	10-20
683E2--- Liscomb	0-12	Loam, silt loam	CL	A-6	0	100	100	85-95	60-80	30-40	10-20
	12-45	Loam, sandy clay loam, clay loam.	CL, SC	A-6	0-5	95-100	90-95	85-95	45-70	30-40	10-20
	45-60	Loam, sandy clay loam.	CL, SC	A-6	0-5	95-100	90-95	85-95	45-70	30-40	10-20
683E3--- Liscomb	0-6	Loam---	CL	A-6	0	100	100	85-95	60-80	30-40	10-20
	6-45	Loam, sandy clay loam, clay loam.	CL, SC	A-6	0-5	95-100	90-95	85-95	45-70	30-40	10-20
	45-60	Loam, sandy clay loam.	CL, SC	A-6	0-5	95-100	90-95	85-95	45-70	30-40	10-20
771B, 771C--- Waubeek	0-10	Silt loam---	CL-ML, CL	A-4, A-6	0	100	100	100	100	25-35	5-15
	10-38	Silty clay loam, silt loam.	CL	A-7	0	100	100	100	100	40-50	15-25
	38-60	Loam, sandy clay loam, clay loam.	CL	A-6	0-5	90-95	85-95	75-85	50-65	25-35	10-20
771C2, 771D2--- Waubeek	0-10	Silt loam---	CL-ML, CL	A-4, A-6	0	100	100	100	100	25-35	5-15
	10-38	Silt loam---	CL-ML, CL	A-4, A-6	0	100	100	100	100	25-35	5-15
	38-60	Loam, sandy clay loam, clay loam.	CL	A-6	0-5	90-95	85-95	75-85	50-65	25-35	---
926--- Canoe	0-20	Silt loam---	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	20-44	Silt loam---	CL-ML, CL	A-4	0	100	100	100	95-100	20-30	5-10
	44-60	Silt loam, silty clay loam.	CL	A-6	0	100	100	100	95-100	30-40	10-20
933B--- Sawmill	0-34	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	30-50	15-30
	34-47	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	30-50	15-30
	47-60	Silty clay loam, silt loam.	CL	A-6, A-7, A-4	0	100	100	85-100	70-95	25-50	8-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
978---------- Festina	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	8-14	Silt loam, silty clay loam.	CL	A-6	0	100	100	100	95-100	30-40	10-20
	14-46	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
	46-60	Stratified silt loam to sand.	SM, SC, ML, CL	A-2, A-4	0	100	100	70-90	15-70	15-30	NP-10
993E2*:											
Gara----------	0-6	Loam, silt loam	CL	A-6, A-7	0	90-95	85-95	70-85	55-75	35-45	15-25
	6-49	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	49-60	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
Armstrong-------	0-15	Silt loam--------	CL, CL-ML	A-6, A-4	0-5	90-100	80-95	75-90	55-80	20-30	5-15
	15-43	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0-5	90-100	80-95	70-90	55-80	45-70	20-35
	43-60	Clay loam--------	CL	A-6	0-5	90-100	80-95	70-90	55-80	30-40	15-20
993E3*:											
Gara----------	0-6	Clay loam--------	CL	A-6, A-7	0	90-95	85-95	70-85	55-75	35-45	15-25
	6-49	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	49-60	Loam, clay loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
Armstrong-------	0-15	Silty clay loam	CL	A-6, A-7	0-5	90-100	80-95	75-90	55-80	35-45	15-25
	15-43	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0-5	90-100	80-95	70-90	55-80	45-70	20-35
	43-60	Clay loam--------	CL	A-6	0-5	90-100	80-95	70-90	55-80	30-40	15-20
1133---------- Colo	0-34	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-60	15-30
	34-42	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-55	20-30
	42-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	80-100	40-55	15-30
1220---------- Nodaway	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-40	5-15
1485---------- Spillville	0-45	Loam----------	CL	A-6	0	100	95-100	85-95	60-80	25-40	10-20
	45-60	Sandy clay loam, loam, sandy loam.	CL, CL-ML, SC-SM, SC	A-6, A-4	0	100	95-100	80-90	35-75	20-40	5-15
5010*, 5030*. Pits											
5040*, 5080*----- Orthents	0-60	Clay loam--------	---	---	---	---	---	---	---	---	15-30
	60-80	Variable---------	---	---	---	---	---	---	---	---	---

* 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				
5B*:										
Ackmore	0-27	18-27	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.32	5	6
	27-60	18-30	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.32		
Colo	0-14	27-36	1.28-1.32	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.28	5	7
	14-46	30-35	1.25-1.35	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.28		
	46-60	25-35	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.3	Moderate	0.32		
7, 7B	0-18	20-28	1.30-1.35	0.6-2.0	0.21-0.23	5.1-7.3	Low	0.28	5	6
Wiota	18-49	30-35	1.30-1.40	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43		
	49-60	25-34	1.40-1.45	0.6-2.0	0.18-0.20	5.6-6.5	Moderate	0.43		
8B	0-36	25-32	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.28	5	7
Judson	36-50	27-35	1.35-1.45	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.43		
	50-60	25-32	1.35-1.45	0.6-2.0	0.21-0.23	6.1-7.8	Moderate	0.43		
11B*:										
Colo	0-14	27-36	1.28-1.32	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.28	5	7
	14-46	30-35	1.25-1.35	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.28		
	46-60	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
	29-44	28-35	1.30-1.40	0.6-2.0	0.18-0.20	6.1-7.3	Moderate	0.43		
	44-60	20-30	1.40-1.45	0.6-2.0	0.18-0.20	6.1-8.4	Moderate	0.43		
20C2, 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	7-29	30-35	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
	29-60	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	7-29	30-35	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
	29-60	26-32	1.40-1.45	0.6-2.0	0.20-0.22	6.1-7.3	Moderate	0.43		
20E2	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	7-29	30-35	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
	29-60	26-32	1.40-1.45	0.6-2.0	0.20-0.22	6.1-7.3	Moderate	0.43		
20E3	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	7-29	30-35	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
	29-60	26-32	1.40-1.45	0.6-2.0	0.20-0.22	6.1-7.3	Moderate	0.43		
24D2	0-8	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.1-7.3	Moderate	0.32	5	6
Shelby	8-42	30-35	1.50-1.55	0.2-0.6	0.16-0.18	5.1-7.3	Moderate	0.28		
	42-60	30-35	1.55-1.65	0.2-0.6	0.16-0.18	6.1-8.4	Moderate	0.37		
24D3	0-8	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.1-7.3	Moderate	0.37	4	6
Shelby	8-42	30-35	1.55-1.65	0.2-0.6	0.16-0.18	5.1-7.3	Moderate	0.37		
	42-60	30-35	1.55-1.65	0.2-0.6	0.16-0.18	6.1-8.4	Moderate	0.37		
24E2	0-8	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.1-7.3	Moderate	0.32	5	6
Shelby	8-42	30-35	1.50-1.55	0.2-0.6	0.16-0.18	5.1-7.3	Moderate	0.28		
	42-60	30-35	1.55-1.65	0.2-0.6	0.16-0.18	6.1-8.4	Moderate	0.37		

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				
24E3----------	0-8	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.1-7.3	Moderate-----	0.37	4	6
Shelby	8-42	30-35	1.55-1.65	0.2-0.6	0.16-0.18	5.1-7.3	Moderate-----	0.37		
	42-60	30-35	1.55-1.65	0.2-0.6	0.16-0.18	6.1-8.4	Moderate-----	0.37		
43----------	0-18	27-36	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.32	5	7
Bremer	18-41	35-42	1.30-1.40	0.2-0.6	0.15-0.17	5.6-6.5	High---------	0.43		
	41-60	32-38	1.40-1.45	0.2-0.6	0.18-0.20	5.6-6.5	High---------	0.43		
63D----------	0-12	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low----------	0.17	5	2
Chelsea	12-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.5	Low----------	0.17		
63F----------	0-12	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low----------	0.17	5	2
Chelsea	12-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.5	Low----------	0.17		
65D2, 65E2-------	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	6-42	25-35	1.40-1.60	0.2-0.6	0.14-0.18	4.5-6.5	Moderate-----	0.32		
	42-60	18-32	1.45-1.65	0.2-0.6	0.12-0.16	6.1-7.8	Moderate-----	0.32		
65E3----------	0-6	27-35	1.30-1.40	0.2-0.6	0.14-0.18	4.5-7.3	Moderate-----	0.32	4	6
Lindley	6-42	25-35	1.40-1.60	0.2-0.6	0.14-0.18	4.5-6.5	Moderate-----	0.32		
	42-60	18-32	1.45-1.65	0.2-0.6	0.12-0.16	6.1-7.8	Moderate-----	0.32		
65F, 65F2--------	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	6-42	25-35	1.40-1.60	0.2-0.6	0.14-0.18	4.5-6.5	Moderate-----	0.32		
	42-60	18-32	1.45-1.65	0.2-0.6	0.12-0.16	6.1-7.8	Moderate-----	0.32		
65F3----------	0-6	27-35	1.30-1.40	0.2-0.6	0.14-0.18	4.5-7.3	Moderate-----	0.32	4	6
Lindley	6-42	25-35	1.40-1.60	0.2-0.6	0.14-0.18	4.5-6.5	Moderate-----	0.32		
	42-60	18-32	1.45-1.65	0.2-0.6	0.12-0.16	6.1-7.8	Moderate-----	0.32		
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	6-42	25-35	1.40-1.60	0.2-0.6	0.14-0.18	4.5-6.5	Moderate-----	0.32		
	42-60	18-32	1.45-1.65	0.2-0.6	0.12-0.16	6.1-7.8	Moderate-----	0.32		
83B----------	0-13	18-26	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.24	5	6
Kenyon	13-46	20-30	1.45-1.65	0.6-2.0	0.17-0.19	5.1-7.3	Low----------	0.28		
	46-60	20-24	1.65-1.75	0.6-2.0	0.17-0.19	6.1-8.4	Low----------	0.37		
83C2----------	0-13	18-26	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.28	5	6
Kenyon	13-46	20-30	1.45-1.65	0.6-2.0	0.17-0.19	5.1-7.3	Low----------	0.28		
	46-60	20-24	1.65-1.75	0.6-2.0	0.17-0.19	6.1-8.4	Low----------	0.37		
88----------	0-22	27-29	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.28	5	7
Nevin	22-46	30-35	1.30-1.40	0.6-2.0	0.18-0.20	5.6-6.5	Moderate-----	0.43		
	46-60	25-36	1.40-1.45	0.6-2.0	0.18-0.20	6.6-7.3	Moderate-----	0.43		
110C----------	0-8	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low----------	0.24	5	3
Lamont	8-14	5-15	1.50-1.55	2.0-6.0	0.14-0.16	5.1-7.3	Low----------	0.24		
	14-43	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-7.3	Low----------	0.24		
	43-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low----------	0.17		
118----------	0-23	30-35	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	High---------	0.28	5	7
Garwin	23-52	27-35	1.28-1.35	0.6-2.0	0.18-0.20	6.1-7.3	High---------	0.28		
	52-60	20-26	1.35-1.45	0.6-2.0	0.20-0.22	6.6-7.8	Moderate-----	0.43		
119----------	0-22	28-30	1.30-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Moderate-----	0.28	5	7
Muscatine	22-47	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		

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				
119B	0-22	28-30	1.30-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.28	5	7
Muscatine	22-47	30-35	1.28-1.35	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.43		
	47-50	22-30	1.35-1.40	0.6-2.0	0.18-0.20	6.6-7.8	Moderate	0.43		
120, 120B	0-14	27-29	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.28	5	7
Tama	14-45	27-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43		
	45-60	22-28	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
120B2	0-7	27-32	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.32	5	7
Tama	7-14	27-32	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.32		
	14-45	27-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43		
	45-60	22-28	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
120C	0-14	27-29	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.28	5	7
Tama	14-45	27-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43		
	45-60	22-28	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
120C2	0-7	27-32	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.32	5	7
Tama	7-14	27-32	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.32		
	14-45	27-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43		
	45-60	22-28	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
120C3	0-6	30-35	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.43	4	7
Tama	6-33	30-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43		
	33-60	22-28	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
120D2	0-7	27-32	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.32	5	7
Tama	7-14	27-32	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.32		
	14-45	27-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43		
	45-60	22-28	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
120D3	0-6	30-35	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.43	4	7
Tama	6-33	30-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43		
	33-60	22-28	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
120E2	0-7	27-32	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.32	5	7
Tama	7-14	27-32	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.32		
	14-45	27-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43		
	45-60	22-28	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
122	0-7	18-22	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Moderate	0.37	3	6
Sperry	7-13	18-22	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Moderate	0.43		
	13-46	38-45	1.40-1.45	0.06-0.2	0.14-0.16	5.1-6.5	High	0.43		
	46-60	26-34	1.45-1.50	0.2-0.6	0.19-0.21	5.6-6.5	High	0.43		
133	0-14	27-36	1.28-1.32	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.28	5	7
Colo	14-46	30-35	1.25-1.35	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.28		
	46-60	25-35	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.3	Moderate	0.32		
133+	0-12	20-26	1.25-1.30	0.6-2.0	0.22-0.24	5.6-7.3	Moderate	0.28	5	6
Colo	12-48	30-35	1.25-1.35	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.28		
	48-60	25-35	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.3	Moderate	0.32		
134	0-39	40-44	1.35-1.40	0.06-0.2	0.11-0.13	5.6-7.3	High	0.28	5	4
Zook	39-60	36-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.8	High	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				
162B, 162C, 162C2, 162D, 162D2	0-7	18-26	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Low	0.32	5	6
Downs	7-49	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate	0.43		
	49-60	22-26	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
162D3	0-3	27-32	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate	0.43	4	7
Downs	3-42	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate	0.43		
	42-60	22-26	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
162E2	0-7	18-26	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Low	0.32	5	6
Downs	7-49	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate	0.43		
	49-60	22-26	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
162E3	0-3	27-32	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate	0.43	4	7
Downs	3-42	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate	0.43		
	42-60	22-26	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
162F, 162F2	0-7	18-26	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Low	0.32	5	6
Downs	7-49	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate	0.43		
	49-60	22-26	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
162F3	0-3	27-32	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate	0.43	4	7
Downs	3-42	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate	0.43		
	42-60	22-26	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
163B	0-6	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.32	5	6
Fayette	6-42	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	42-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
163C	0-6	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.32	5	6
Fayette	6-54	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	54-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
163C2	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	6-42	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	42-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
163D	0-6	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.32	5	6
Fayette	6-42	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	42-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
163D2	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	6-42	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	42-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
163D3	0-3	27-32	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.43	4	7
Fayette	3-38	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	38-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
163E	0-6	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.32	5	6
Fayette	6-42	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	42-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
163E2	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	6-42	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	42-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	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	0-3	27-32	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.43	4	7
Fayette	3-38	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	38-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
163F	0-6	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.32	5	6
Fayette	6-42	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	42-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
163F2	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	6-42	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	42-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
163F3	0-3	27-32	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.43	4	7
Fayette	3-38	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	38-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
163G	0-6	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.32	5	6
Fayette	6-42	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	42-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
164	0-10	18-24	1.35-1.40	0.6-2.0	0.20-0.22	4.5-7.3	Moderate	0.43	3	6
Traer	10-41	35-40	1.40-1.45	0.06-0.2	0.18-0.20	4.5-7.8	High	0.43		
	41-60	22-27	1.45-1.50	0.6-2.0	0.20-0.22	6.1-7.8	Moderate	0.43		
174B	0-13	20-26	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.24	4	6
Bolan	13-34	12-20	1.45-1.50	0.6-2.0	0.17-0.19	5.6-6.5	Low	0.24		
	34-60	10-16	1.50-1.60	2.0-6.0	0.11-0.13	5.6-7.3	Low	0.24		
174C	0-13	20-26	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.24	4	6
Bolan	13-34	12-20	1.45-1.50	0.6-2.0	0.17-0.19	5.6-6.5	Low	0.24		
	34-60	10-16	1.50-1.60	2.0-6.0	0.11-0.13	5.6-7.3	Low	0.24		
175B, 175C	0-13	10-18	1.50-1.55	2.0-6.0	0.12-0.15	5.6-7.3	Low	0.20	4	3
Dickinson	13-23	10-18	1.50-1.55	2.0-6.0	0.12-0.15	5.6-7.3	Low	0.20		
	23-44	10-15	1.45-1.55	2.0-6.0	0.12-0.15	5.1-6.5	Low	0.24		
	44-60	4-10	1.60-1.70	6.0-20	0.02-0.04	5.6-6.5	Low	0.15		
179D2	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	7-50	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-7.3	Moderate	0.32		
	50-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	5.6-8.4	Moderate	0.37		
179D3	0-7	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.6-7.3	Moderate	0.37	4	6
Gara	7-45	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-7.3	Moderate	0.32		
	45-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	5.6-8.4	Moderate	0.37		
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	7-50	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-7.3	Moderate	0.32		
	50-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	5.6-8.4	Moderate	0.37		
179E3	0-7	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.6-7.3	Moderate	0.37	4	6
Gara	7-45	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-7.3	Moderate	0.32		
	45-60	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	7-50	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-7.3	Moderate	0.32		
	50-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	5.6-8.4	Moderate	0.37		
179F3	0-7	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.6-7.3	Moderate	0.37	4	6
Gara	7-45	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-7.3	Moderate	0.32		
	45-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	5.6-8.4	Moderate	0.37		

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				
220	0-7	18-27	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Low	0.32	5	6
Nodaway	7-60	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate	0.43		
222D2	0-9	27-38	1.45-1.50	0.2-0.6	0.17-0.19	5.1-7.3	Moderate	0.37	3	7
Clarinda	9-47	40-60	1.45-1.60	<0.6	0.14-0.16	5.1-6.5	High	0.37		
	47-60	38-60	1.50-1.60	<0.06	0.14-0.16	5.6-8.4	High	0.37		
226	0-11	18-27	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.24	4	6
Lawler	11-35	15-27	1.45-1.60	0.6-2.0	0.16-0.18	5.1-6.5	Low	0.28		
	35-60	2-8	1.60-1.75	>20	0.02-0.04	5.1-7.3	Low	0.10		
269	0-16	24-27	1.35-1.40	0.6-2.0	0.21-0.23	5.1-7.3	Low	0.43	4	6
Humeston	16-28	20-26	1.30-1.35	0.2-2.0	0.20-0.22	4.5-6.0	Moderate	0.43		
	28-60	35-48	1.35-1.50	<0.06	0.13-0.15	4.5-6.5	High	0.32		
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	8-14	15-26	1.40-1.60	0.6-2.0	0.21-0.24	5.1-7.3	Low	0.32		
	14-44	25-35	1.40-1.60	0.6-2.0	0.14-0.24	5.1-7.3	Moderate	0.43		
	44-60	18-27	1.40-1.65	0.6-2.0	0.14-0.24	5.6-7.8	Low	0.43		
293D*:										
Chelsea	0-12	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low	0.17	5	2
	12-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.5	Low	0.17		
Lamont	0-8	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low	0.24	5	3
	8-14	5-15	1.50-1.55	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	14-43	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	43-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low	0.17		
Fayette	0-11	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.32	5	6
	11-48	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	48-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
293D2*:										
Chelsea	0-12	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low	0.17	5	2
	12-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.5	Low	0.17		
Lamont	0-8	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low	0.24	5	3
	8-14	5-15	1.50-1.55	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	14-43	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	43-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low	0.17		
Fayette	0-11	25-27	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.37	5	6
	11-48	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	48-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
293E*:										
Chelsea	0-12	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low	0.17	5	2
	12-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.5	Low	0.17		
Lamont	0-8	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low	0.24	5	3
	8-14	5-15	1.50-1.55	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	14-43	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	43-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low	0.17		
Fayette	0-11	15-27	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	0.43		
	47-73	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	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				
293E2*:										
Chelsea	0-12	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low	0.17	5	2
	12-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.5	Low	0.17		
Lamont	0-8	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low	0.24	5	3
	8-14	5-15	1.50-1.55	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	14-43	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	43-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low	0.17		
Fayette	0-11	25-27	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.37	5	6
	11-47	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	47-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
293F*:										
Chelsea	0-12	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low	0.17	5	2
	12-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.5	Low	0.17		
Lamont	0-8	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low	0.24	5	3
	8-14	5-15	1.50-1.55	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	14-43	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	43-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low	0.17		
Fayette	0-11	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.32	5	6
	11-48	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	48-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
293F2*:										
Chelsea	0-12	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low	0.17	5	2
	12-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.5	Low	0.17		
Lamont	0-8	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low	0.24	5	3
	8-14	5-15	1.50-1.55	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	14-43	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	43-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low	0.17		
Fayette	0-11	25-27	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.37	5	6
	11-48	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	48-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
293G*:										
Chelsea	0-12	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low	0.17	5	2
	12-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.5	Low	0.17		
Lamont	0-8	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low	0.24	5	3
	8-14	5-15	1.50-1.55	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	14-43	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	43-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low	0.17		
Fayette	0-11	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.32	5	6
	11-48	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43		
	48-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43		
350, 350B, 350C--Waukegan	0-12	18-27	1.35-1.55	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.32	4	6
	12-35	18-27	1.35-1.55	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.43		
	35-60	1-10	1.50-1.70	6.0-20	0.02-0.04	5.6-7.8	Low	0.10		
354*--Aquolls	0-60	---	---	0.6-6.0	---	---	---	---	---	---

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				
377B	0-20	27-32	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate	0.28	5	7
Dinsdale	20-37	30-34	1.30-1.35	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.43		
	37-60	20-28	1.65-1.75	0.6-2.0	0.17-0.19	5.6-8.4	Low	0.43		
377B2	0-20	27-32	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate	0.32	5	7
Dinsdale	20-37	30-34	1.30-1.35	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.43		
	37-60	20-28	1.65-1.75	0.6-2.0	0.17-0.19	5.6-8.4	Low	0.43		
377C	0-20	27-32	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate	0.28	5	7
Dinsdale	20-37	30-34	1.30-1.35	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.43		
	37-60	20-28	1.65-1.75	0.6-2.0	0.17-0.19	5.6-8.4	Low	0.43		
377C2, 377D2	0-20	27-32	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate	0.32	5	7
Dinsdale	20-37	30-34	1.30-1.35	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.43		
	37-60	20-28	1.65-1.75	0.6-2.0	0.17-0.19	5.6-8.4	Low	0.43		
377D3	0-7	27-32	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate	0.32	4	7
Dinsdale	7-37	30-34	1.30-1.35	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.43		
	37-60	20-28	1.65-1.75	0.6-2.0	0.17-0.19	5.6-8.4	Low	0.43		
420B, 420C	0-21	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	21-45	27-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43		
	45-60	22-28	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
424E2*, 424F2*:										
Lindley	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
	6-42	25-35	1.40-1.60	0.2-0.6	0.14-0.18	4.5-6.5	Moderate	0.32		
	42-60	18-32	1.45-1.65	0.2-0.6	0.12-0.16	6.1-7.8	Moderate	0.32		
Keswick	0-11	22-27	1.45-1.50	0.6-2.0	0.17-0.22	4.5-7.3	Moderate	0.37	3	6
	11-50	35-60	1.45-1.60	0.06-0.2	0.11-0.15	4.5-6.0	High	0.37		
	50-60	30-40	1.60-1.75	0.2-0.6	0.12-0.16	4.5-7.8	Moderate	0.37		
424F3*:										
Lindley	0-6	27-35	1.30-1.40	0.2-0.6	0.14-0.18	4.5-7.3	Moderate	0.32	5-4	6
	6-42	25-35	1.40-1.60	0.2-0.6	0.14-0.18	4.5-6.5	Moderate	0.32		
	42-60	18-32	1.45-1.65	0.2-0.6	0.12-0.16	6.1-7.8	Moderate	0.32		
Keswick	0-11	27-40	1.45-1.50	0.2-0.6	0.17-0.19	4.5-7.3	Moderate	0.37	2	4
	11-48	35-60	1.45-1.60	0.06-0.2	0.11-0.15	4.5-6.0	High	0.37		
	48-60	30-40	1.60-1.75	0.2-0.6	0.12-0.16	4.5-7.8	Moderate	0.37		
428B	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
Ely	29-44	28-35	1.30-1.40	0.6-2.0	0.18-0.20	6.1-7.3	Moderate	0.43		
	44-60	20-30	1.40-1.45	0.6-2.0	0.18-0.20	6.6-8.4	Moderate	0.43		
429D2*, 429E2*:										
Downs	0-7	18-26	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Low	0.32	5	6
	7-47	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate	0.43		
	47-60	22-26	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
Lamont	0-8	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low	0.24	5	3
	8-14	5-15	1.50-1.55	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	14-43	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	43-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low	0.17		
429E3*:										
Downs	0-7	27-32	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate	0.43	4	7
	7-47	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate	0.43		
	47-60	22-26	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	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				
429E3*:										
Lamont	0-8	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low	0.24	4	3
	8-14	5-15	1.50-1.55	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	14-43	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	43-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low	0.17		
429F2*:										
Downs	0-7	18-26	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Low	0.32	5	6
	7-47	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate	0.43		
	47-60	22-26	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
Lamont	0-8	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low	0.24	5	3
	8-14	5-15	1.50-1.55	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	14-43	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-7.3	Low	0.24		
	43-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low	0.17		
430	0-27	18-27	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.37	5	6
Ackmore	27-60	18-30	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.37		
430B	0-27	18-27	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.32	5	6
Ackmore	27-60	18-30	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.32		
462B, 462C	0-11	18-26	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Low	0.32	5	6
Downs	11-47	26-35	1.30-1.35	0.6-2.0	0.18-0.20	4.5-7.3	Moderate	0.43		
	47-60	22-26	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
478G*:										
Emeline	0-8	12-27	1.15-1.20	0.6-2.0	0.17-0.22	6.1-8.4	Moderate	0.28	1	4L
	8-60	---	---	<0.06	---	---	---	---		
Rock outcrop.										
484	0-7	10-27	1.20-1.55	0.6-2.0	0.22-0.24	6.1-7.8	Low	0.28	5	5
Lawson	7-35	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		
485	0-45	18-26	1.45-1.55	0.6-2.0	0.19-0.21	5.6-7.3	Moderate	0.24	5	6
Spillville	45-60	14-24	1.55-1.70	0.6-6.0	0.15-0.18	5.6-7.3	Low	0.28		
673D2, 673D3, 673E2, 673E3, 673F2, 673F3, 673G	0-6	10-18	1.30-1.60	0.6-2.0	0.20-0.24	6.1-7.8	Low	0.37	5-4	5
Timula	6-60	10-18	1.40-1.60	0.6-2.0	0.18-0.20	7.4-8.4	Low	0.37		
683C2, 683D2	0-12	20-25	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.28	5	6
Liscomb	12-45	20-28	1.45-1.65	0.6-2.0	0.17-0.19	5.6-7.3	Low	0.37		
	45-60	20-24	1.65-1.80	0.6-2.0	0.15-0.17	6.1-7.8	Low	0.37		
683D3	0-6	20-25	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.37	4	6
Liscomb	6-45	20-28	1.45-1.65	0.6-2.0	0.17-0.19	5.6-7.3	Low	0.37		
	45-60	20-24	1.65-1.80	0.6-2.0	0.15-0.17	6.1-7.8	Low	0.37		
683E2	0-12	20-25	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.28	5	6
Liscomb	12-45	20-28	1.45-1.65	0.6-2.0	0.17-0.19	5.6-7.3	Low	0.37		
	45-60	20-24	1.65-1.80	0.6-2.0	0.15-0.17	6.1-7.8	Low	0.37		

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				
683E3----------	0-6	20-25	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37	4	6
Liscomb	6-45	20-28	1.45-1.65	0.6-2.0	0.17-0.19	5.6-7.3	Low----------	0.37		
	45-60	20-24	1.65-1.80	0.6-2.0	0.15-0.17	6.1-7.8	Low----------	0.37		
771B, 771C-------	0-10	18-26	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.28	5	6
Waubeek	10-38	25-34	1.25-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.43		
	38-60	20-28	1.65-1.75	0.6-2.0	0.17-0.19	5.1-7.3	Low----------	0.37		
771C2, 771D2-----	0-10	18-26	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.32	5	6
Waubeek	10-38	18-26	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.32		
	38-60	20-28	1.65-1.75	0.6-2.0	0.17-0.19	5.1-7.3	Low----------	0.37		
926----------	0-20	18-24	1.30-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	6
Canoe	20-44	20-30	1.35-1.40	0.6-2.0	0.20-0.22	5.1-6.0	Low----------	0.43		
	44-60	18-26	1.40-1.45	0.6-2.0	0.20-0.22	5.1-6.5	Moderate-----	0.43		
933B----------	0-34	27-35	1.20-1.40	0.6-2.0	0.21-0.23	6.1-7.8	Moderate-----	0.28	5	7
Sawmill	34-47	30-35	1.20-1.40	0.6-2.0	0.21-0.23	6.1-7.8	Moderate-----	0.28		
	47-60	25-35	1.30-1.45	0.6-2.0	0.17-0.20	6.1-7.8	Moderate-----	0.28		
978----------	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
Festina	8-14	24-29	1.35-1.40	0.6-2.0	0.20-0.22	5.1-6.5	Moderate-----	0.43		
	14-46	22-26	1.40-1.45	0.6-2.0	0.20-0.22	5.1-6.5	Moderate-----	0.43		
	46-60	8-18	1.45-1.55	2.0-6.0	0.10-0.18	6.1-7.3	Low----------	0.43		
993E2*:										
Gara----------	0-6	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.6-7.3	Moderate-----	0.32	5	6
	6-49	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-7.3	Moderate-----	0.32		
	49-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	5.6-8.4	Moderate-----	0.37		
Armstrong-------	0-15	22-27	1.45-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.32	3	6
	15-43	36-60	1.45-1.55	0.06-0.2	0.11-0.16	4.5-7.3	High---------	0.32		
	43-60	30-36	1.55-1.70	0.2-0.6	0.14-0.16	5.1-7.8	Moderate-----	0.32		
993E3*:										
Gara----------	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
	6-49	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-7.3	Moderate-----	0.32		
	49-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	5.6-8.4	Moderate-----	0.37		
Armstrong-------	0-15	27-38	1.45-1.50	0.2-0.6	0.18-0.20	5.6-7.3	Moderate-----	0.37	2	7
	15-43	36-60	1.45-1.55	0.06-0.2	0.11-0.16	4.5-7.3	High---------	0.32		
	43-60	30-36	1.55-1.70	0.2-0.6	0.14-0.16	5.1-7.8	Moderate-----	0.32		
1133----------	0-34	27-36	1.28-1.32	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.28	5	7
Colo	34-42	30-35	1.25-1.35	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.28		
	42-60	25-35	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.32		
1220----------	0-7	18-27	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Low----------	0.32	5	6
Nodaway	7-60	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate-----	0.43		
1485----------	0-45	18-26	1.45-1.55	0.6-2.0	0.19-0.21	5.6-7.3	Moderate-----	0.24	5	6
Spillville	45-60	14-24	1.55-1.70	0.6-6.0	0.15-0.18	5.6-7.3	Low----------	0.28		
5010*, 5030*.										
Pits										
5040*, 5080*-----	0-60	18-35	1.45-1.65	0.06-2.0	0.12-0.18	---	Moderate-----	0.32	5	6
Orthents	60-80	---	---	0.06-2.0	---	---	----------	----		

* 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				
5B*:												
Ackmore	B	Occasional	Very brief or brief.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Low.
Colo	B/D	Occasional	Very brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
7, 7B Wiota	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
8B Judson	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Low.
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, 20D2, 20D3, 20E2, 20E3 Killduff	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
24D2, 24D3, 24E2, 24E3 Shelby	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
43 Bremer	C	Occasional	Very brief	Feb-Nov	1.0-2.0	Apparent	Nov-Jul	>60	---	High	Moderate	Moderate.
63D, 63F Chelsea	A	None	---	---	>6.0	---	---	>60	---	Low	Low	Low.
65D2, 65E2, 65E3, 65F, 65F2, 65F3, 65G Lindley	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
83B, 83C2 Kenyon	B	None	---	---	>6.0	---	---	>60	---	Moderate	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				
88---------- Nevin	B	Rare---------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Low.
110C---------- Lamont	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
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.
120, 120B, 120B2, 120C, 120C2, 120C3, 120D2, 120D3, 120E2----- Tama	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
122---------- Sperry	C/D	None---------	---	---	+1-1.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
133, 133+--------- Colo	B/D	Occasional	Very brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
134---------- Zook	C/D	Occasional	Brief or long.	Feb-Nov	0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
162B, 162C, 162C2, 162D, 162D2, 162D3, 162E2, 162E3, 162F, 162F2, 162F3----- Downs	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
163B, 163C, 163C2, 163D, 163D2, 163D3, 163E, 163E2, 163E3, 163F, 163F2, 163F3, 163G------ Fayette	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
164---------- Traer	B/D	None---------	---	---	0-2.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
174B, 174C-------- Bolan	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	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				
175B, 175C--------- Dickinson	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
179D2, 179D3, 179E2, 179E3, 179F2, 179F3----- Gara	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
220---------- Nodaway	B	Occasional	Very brief or brief.	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	High-----	Moderate	Low.
222D2---------- Clarinda	D	None---------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High-----	High-----	Moderate.
226---------- Lawler	B	None---------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
269---------- Humeston	C/D	Rare---------	---	---	0-1.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
291---------- Atterberry	B	None---------	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
293D*, 293D2*, 293E*, 293E2*, 293F*, 293F2*, 293G*:												
Chelsea--------- Lamont---------- Fayette---------	A B B	None--------- None--------- None---------	--- --- ---	--- --- ---	>6.0 >6.0 >6.0	--- --- ---	--- --- ---	>60 >60 >60	--- --- ---	Low------ Moderate High-----	Low------ Low------ Moderate	Low. Moderate. Moderate.
350, 350B, 350C--- Waukegan	B	None---------	---	---	>6.0	---	---	>60	---	Low------	Low------	Moderate.
354*---------- Aquolls	---	None---------	---	---	+.5-2.0	Apparent	Jan-Dec	>60	---	---	---	---
377B, 377B2, 377C, 377C2, 377D2, 377D3---------- Dinsdale	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
420B, 420C--------- 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				
424E2*, 424F2*, 424F3*:												
Lindley	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Keswick	C	None	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High	High	Moderate.
428B--- Ely	B	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
429D2*, 429E2*, 429E3*, 429F2*:												
Downs	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
Lamont	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	Moderate.
430--- Ackmore	B	Occasional	Very brief or brief.	Feb-Nov	0-3.0	Apparent	Nov-Jul	>60	---	High	High	Low.
430B--- Ackmore	B	Occasional	Very brief or brief.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Low.
462B, 462C--- Downs	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
478G*:												
Emeline	D	None	---	---	>6.0	---	---	4-12	Hard	Moderate	Low	Low.
Rock outcrop.												
484--- Lawson	C	Occasional	Brief or long.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	Moderate	Low.
485--- Spillville	B	Occasional	Very brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	High	Moderate.
673D2, 673D3, 673E2, 673E3, 673F2, 673F3, 673G--- Timula	B	None	---	---	>6.0	---	---	>60	---	High	Low	Low.
683C2, 683D2, 683D3, 683E2, 683E3--- Liscomb	B	None	---	---	>6.0	---	---	>60	---	Moderate	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				
771B, 771C, 771C2, 771D2---------- Waubeek	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
926---------- Canoe	B	Rare---------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
933B---------- Sawmill	B/D	Rare---------	---	---	0-2.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Low.
978---------- Festina	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
993E2*, 993E3*: Gara----------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Armstrong--------	C	None---------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High-----	High-----	Moderate.
1133---------- Colo	B/D	Frequent----	Very brief or long.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
1220---------- Nodaway	B	Frequent----	Very brief or brief.	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	High-----	Moderate	Low.
1485---------- Spillville	B	Frequent----	Very brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	High-----	Moderate.
5010*, 5030*. Pits												
5040*, 5080*------ Orthents	---	None---------	---	---	>6.0	---	---	>60	---	---	---	---

* 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
Aquolls	Aquolls
Armstrong	Fine, montmorillonitic, mesic Aquollic Hapludalfs
*Atterberry	Fine-silty, mixed, mesic Udollic Ochraqualfs
Bolan	Coarse-loamy, mixed, mesic Typic Hapludolls
Bremer	Fine, montmorillonitic, mesic Typic Argiaquolls
*Canoe	Fine-silty, mixed, mesic Udollic Ochraqualfs
Chelsea	Mixed, mesic Alfic Udipsamments
*Clarinda	Fine, montmorillonitic, mesic, sloping Typic Argiaquolls
Colo	Fine-silty, mixed, mesic Cumulic Haplaquolls
Dickinson	Coarse-loamy, mixed, mesic Typic Hapludolls
Dinsdale	Fine-silty, mixed, mesic Typic Argiudolls
Downs	Fine-silty, mixed, mesic Mollic Hapludalfs
Ely	Fine-silty, mixed, mesic Cumulic Hapludolls
Emeline	Loamy, mixed, mesic Lithic Hapludolls
Fayette	Fine-silty, mixed, mesic Typic Hapludalfs
Festina	Fine-silty, mixed, mesic Mollic Hapludalfs
Gara	Fine-loamy, mixed, mesic Mollic Hapludalfs
Garwin	Fine-silty, mixed, mesic Typic Haplaquolls
Humeston	Fine, montmorillonitic, mesic Argiaquic Argialbolls
Judson	Fine-silty, mixed, mesic Cumulic Hapludolls
Kenyon	Fine-loamy, mixed, mesic Typic Hapludolls
Keswick	Fine, montmorillonitic, mesic Aquic Hapludalfs
Killduff	Fine-silty, mixed, mesic Dystric Eutrochrepts
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
*Liscomb	Fine-loamy, mixed, mesic Typic Hapludolls
Muscatine	Fine-silty, mixed, mesic Aquic Hapludolls
Nevin	Fine-silty, mixed, mesic Aquic Argiudolls
Nodaway	Fine-silty, mixed, nonacid, mesic Mollic Udifluvents
Orthents	Orthents
Sawmill	Fine-silty, mixed, mesic Cumulic Haplaquolls
*Shelby	Fine-loamy, mixed, mesic Typic Argiudolls
Sperry	Fine, montmorillonitic, mesic Typic Argialbolls
Spillville	Fine-loamy, mixed, mesic Cumulic Hapludolls
Tama	Fine-silty, mixed, mesic Typic Argiudolls
Timula	Coarse-silty, mixed, mesic Typic Eutrochrepts
Traer	Fine, montmorillonitic, mesic Typic Ochraqualfs
Waubeek	Fine-silty, mixed, mesic Mollic Hapludalfs
Waukegan	Fine-silty over sandy or sandy-skeletal, mixed, mesic Typic Hapludolls
Wiota	Fine-silty, mixed, mesic Typic Argiudolls
Zook	Fine, montmorillonitic, mesic Cumulic Haplaquolls

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