United States Department of Agriculture

Natural Resources Conservation Service

Iowa Department of Agriculture and Land Stewardship

IOWA STATE UNIVERSITY
Iowa Agriculture and Home Economics Experiment Station

IOWA STATE UNIVERSITY
University Extension

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

Soil Survey of Clay County, Iowa

NRCS Accessibility Statement

The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at helpdesk@helpdesk.itc.nrcs.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

How To Use This Soil Survey

General Soil Map

The general soil map, which is a color map, 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.

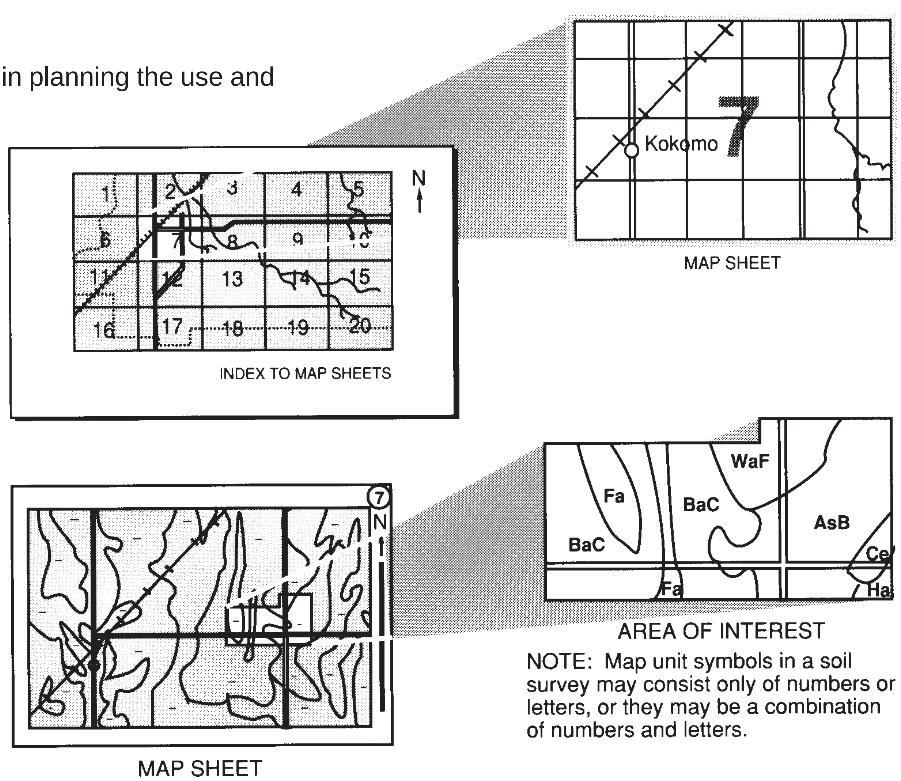
Detailed Soil Maps

The detailed soil maps 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**. Note the number of the map sheet and turn to that sheet.

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

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **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 1999. Soil names and descriptions were approved in 2002. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2002. This survey was made cooperatively by the Natural Resources Conservation Service; the Iowa Agriculture and Home Economics Experiment Station and the Cooperative Extension Service, Iowa State University; the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship; and the Clay County Conference Board. The survey is part of the technical assistance furnished to the Clay County Soil and Water Conservation District.

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

Cover: A grassed waterway in a nearly level to gently sloping area of Sac, McCreath, and Afton soils. These soils are well suited to the production of corn, but water erosion is a slight hazard.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service homepage on the World Wide Web. The address is http://www.nrcs.usda.gov.

Contents

Issued 2005

Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, 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.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

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, and information on specific uses is given. 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.

Richard W. Van Klaveren
State Conservationist
Natural Resources Conservation Service

Where To Get Updated Information

The soil properties and interpretations included in this survey were current as of April 2003. More current information may be available from the Natural Resources Conservation Service (NRCS) Field Office Technical Guide at Spencer, Iowa, or online at www.nrcs.usda.gov/technical/efotg. The data in the Field Office Technical Guide are updated periodically.

More current information may also be available through the NRCS Soil Data Mart Website at http://soildatamart.nrcs.usda.gov/

Additional information about soils and about NRCS is available through the Iowa NRCS Web page at www.ia.nrcs.usda.gov.

For further information, please contact:

USDA, Natural Resources Conservation Service
Iowa State Office
210 Walnut Street, Suite 693
Des Moines, IA 50309-2180
Phone: 515-284-4353

Soil Survey of Clay County, Iowa

By Robin Wisner, Natural Resources Conservation Service

Fieldwork by Joseph Falkenberg, Joe Johnson, and Richard Lensch, Natural Resources Conservation Service

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

CLAY COUNTY is in northwestern Iowa (fig. 1). It has a total area of 366,400 acres, or 572 square miles. Spencer, the county seat, is in the north-central part of the county.

The county is mainly agricultural. The principal crops are corn and soybeans, but oats, grasses, and legumes are grown for hay and pasture. The raising of livestock is also an important source of income in the county. The major livestock are hogs, cow-calf herds, and poultry. Some dairy cattle also are raised. A very small acreage along the Little Sioux River and its tributaries is used as woodland or woodland pasture. Nonagricultural industries are becoming increasingly important in the county.

This survey updates an earlier survey of Clay County published in 1969 (Fisher, 1969). It provides additional information and has larger maps, which show the soils in greater detail.

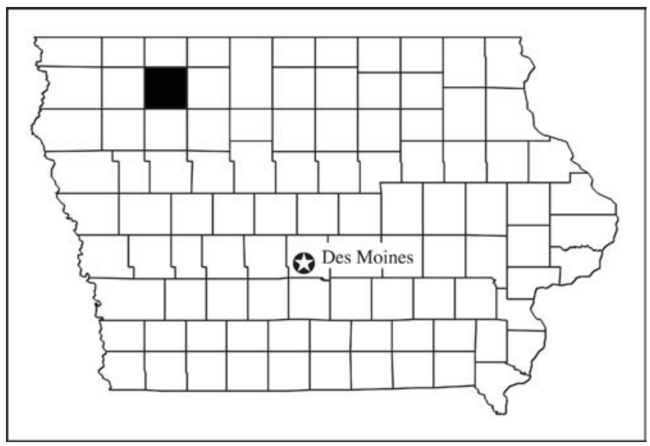


Figure 1.—Location of Clay County in Iowa.

General Nature of the Survey Area

This section provides some general information about Clay County. It describes history; industry, transportation facilities, and recreation; physiography, drainage, and geology; and climate.

History

The first European settlers in the survey area arrived in 1856, when Christian Kirchner and Ambros S. Mead settled in what is now southwestern Clay County. Several other families moved into the same area later in the same year. Clay County was originally part of Woodbury County, but it was established as a separate county with elected officials in 1858. Since most residents lived in the southwest corner of the county, the town of Peterson was selected as the first county seat. In 1871, the county seat was moved to Spencer. By 1880, the population of Clay County had grown to 4,248; by 1920, it had grown to about 15,600. The population growth rate began to slow after 1920. According to the 2000 U.S. Census, the population of the county is 17,372 (Iowa State University, 2002). Spencer has a population of 11,317 and is the largest city in the county.

Industry, Transportation Facilities, and Recreation

Clay County is primarily rural, and the vast majority of the land is dedicated to farming. In 1997, Clay County had 285,829 acres of farmland on 668 farms (Iowa State University, 2002). Corn, soybeans, oats, and grass-legume hay accounted for 262,903 acres of the farmland in production. The rest of the acreage was used primarily for pasture or woodland or was idle land. In recent years, the number of farms in the county has been decreasing and the average size of farms increasing. Livestock production is becoming more specialized; many farmers raise only one class of livestock. In recent years, the number of total confinement livestock systems has been increasing, particularly those raising swine or poultry. There are many agriculture-related industries throughout the county, including an extensive rural water supplier. Grain elevator facilities are in most communities.

The largest employers in the county are nonfarm industries, including the service industries and retail trade. The county has manufacturers of hydrostatic transmissions and hydraulic pumps, several skilled machining and metal fabrication companies, and a large offset printing company. Many other smaller industries, particularly in Spencer, are major contributors to the local economy of Clay County.

Two major highways divide Clay County. U.S. Highway 18 crosses from east to west, and U.S. Highway 71 crosses from north to south. These two highways intersect in the city of Spencer. Hard-surface state and county roads connect these highways to all of the other communities in the county and surrounding area and to many of the farms. Most farms, however, are on gravel roads with access to the hard-surface roads. One railroad provides rail service to the towns of Dickens, Spencer, and Everly along U.S. Highway 18. The county has one municipal airport, which is about 2 miles west of Spencer. Motor freight lines serve every trading center in the county.

Many parks and Little Sioux River access areas have been established throughout Clay County. Wanata State Park is near the town of Peterson, and Kindlespire Little Sioux River Access is about 5 miles west of Webb. The lakes, rivers, and streams in the county provide excellent potential for recreational activities, such as hunting, fishing, fur trapping, and water sports. Barringer Slough, Dan Green Slough, and Lost Island Lake in the northeastern part of the county are a few of the natural areas. Wooded areas along rivers and streams, many natural and constructed wetlands, and farm windbreaks provide important habitat for wildlife. The county typically has a good population of upland game birds, such as ringneck pheasant, Hungarian partridge, and wild turkey. A number of small ponds are stocked with smallmouth bass, bluegill, and other game fish and thus provide excellent fishing opportunities. Whitetail deer are typically plentiful, and hunting them is a popular recreational activity, particularly in the wooded, steep and very steep areas along the Little Sioux River.

Physiography, Drainage, and Geology

The topography in Clay County is somewhat divided between the older erosion surface in the western two-thirds of the county and the geologically immature eastern one-third. The Little Sioux River basically dissects these two areas. The former is referred to by soil scientists as Major Land Resource Area (MLRA) 107 and is evidenced by broad, nearly level upland divides and by more sloping areas along the major streams (USDA, 1981). The eastern one-third of the county is referred to as MLRA 103 and is evidenced by rolling topography with a large number of potholes and depressions in the uplands and by steep and very steep topography along the major streams.

Till underlies all of the soils in Clay County and is the greatest influence on the development of the drainage patterns throughout the county. In the MLRA 107 area, the till is predominantly overlain with loess. The older age of these materials has allowed the formation of a more defined drainage system. The younger glacial soils in MLRA 103, which actually buried the loess-capped older till soils, have a much less defined drainage pattern. Two types of moraine topography are evident in the MLRA 103 area. One is a complex of short uneven slopes that have many small indistinct drainage patterns. The other type of moraine topography is broad flat areas between narrow recessional moraines. These broad flat areas have many depressions that range in size from less than an acre to larger than 600 acres. Elk Lake, Round Lake, and Mud Lake are examples of the larger depressions. Limestone bedrock is very deep beneath the till in the area of Clay County and has little or no influence on the developing drainage patterns.

The Ocheyedan and Little Sioux Rivers and their tributaries drain most of Clay County. The Ocheyedan River flows from near the border with Minnesota in Osceola County southeast to Spencer, where it meets the Little Sioux River. The Little Sioux River also begins near the Minnesota border. It flows nearly straight south and picks up drainage from the Okoboji and Spirit Lake watersheds in Dickinson County and in Clay County west of Fostoria. The Little Sioux River flows slightly east-southeast below Spencer; near Gillett Grove it turns dramatically westward through Peterson towards the Missouri River. It is believed that the Little Sioux River at one time drained towards the Mississippi River, possibly in the Raccoon River watershed. That flow was diverted when glacial ice and debris plugged the valley and created a glacial lake in the area that is now Spencer. When the debris dam broke through, the drainage followed the new path. Stoney Creek drains part of northwestern Clay County and joins the Ocheyedan River east of Everly. Pickerel Run and Lost Island Outlet drain part of northeastern Clay County and join the Little Sioux River at Gillett Grove. Willow Creek drains most of southwestern Clay County. It flows southeast and joins the Little Sioux River just northeast of Cornell, Iowa. Most of these rivers and streams have experienced periods of great flooding, have eroded deep into the till, and in some areas have left sand- and gravel-based terraces above each stage of downcutting.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Spencer in the period 1961 to 1990. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season.

In winter, the average temperature is 17.6 degrees F and the average daily minimum temperature is 8 degrees. The lowest temperature on record, which occurred at Spencer on January 12, 1912, was -38 degrees. In summer, the average temperature is 70.8 degrees and the average daily maximum temperature is 82.5 degrees. The highest temperature, which occurred at Spencer on July 17, 1936, was 113 degrees.

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

The average annual total precipitation is 28.50 inches. Of this total, 18.80 inches, or about 66 percent, usually falls in May through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 5.01 inches recorded at Spencer on September 7, 1964. Thunderstorms occur on about 44 days each year, and most occur between May and August.

The average seasonal snowfall is 27.1 inches. The greatest snow depth at any one time during the period of record was 33 inches recorded on February 27, 1962. On an average, 45 days per year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 14 inches recorded on March 3, 1977.

The average relative humidity in midafternoon is about 70 percent in December and about 50 percent in April. Humidity is higher at night, and the average at dawn is about 80 percent (70 percent in April and May). The sun shines about 70 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the northwest from November to April and from the south in all other months. Average windspeed is highest, around 13 miles per hour, in April.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; 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 and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area 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-vegetation-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. Soil taxonomy, 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 and 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 predict that a high water table will always be at a specific level in the soil on a specific date.

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

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. These broad areas are called associations. Each association on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas 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 or miscellaneous areas can be identified on the map. Likewise, areas that 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. McCreath-Gillett Grove-Sac Association

Nearly level to moderately sloping, moderately well drained to poorly drained, silty soils that formed in loess overlying Wisconsin (Tazewell) till; on uplands (fig. 2)

Setting

Landform and position on the landform: Broad upland flats; knolls and rises
Slope range: 0 to 9 percent

Composition

Extent of the association in the survey area: 17 percent
Extent of the components in the association:
McCreath soils—40 percent
Gillett Grove soils—30 percent
Sac soils—13 percent
Soils of minor extent—17 percent

Soil Properties and Qualities

McCreath

Drainage class: Somewhat poorly drained
Landform and position on the landform: Upland divides
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam

Gillett Grove

Drainage class: Poorly drained
Landform and position on the landform: Broad upland flats
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam

Sac

Drainage class: Moderately well drained
Landform and position on the landform: Summits and hillslopes on uplands
Slope range: 2 to 9 percent
Texture of the surface layer: Silty clay loam

Soils of Minor Extent

- Afton, Annieville, Galva, and Roine soils

Use and Management

Major use: Cropland
Major management considerations: McCreath and Gillett Grove—wetness, maintaining fertility; Sac—erosion, maintaining fertility

2. Wilmonton-Ransom-Afton Association

Nearly level to gently sloping, somewhat poorly drained and poorly drained, loamy and silty soils that formed in loamy pedisediments overlying calcareous till and in loess overlying Wisconsin (Tazewell) till; on uplands

Setting

Landform and position on the landform: Upland flats; ridges and side slopes
Slope range: 0 to 3 percent

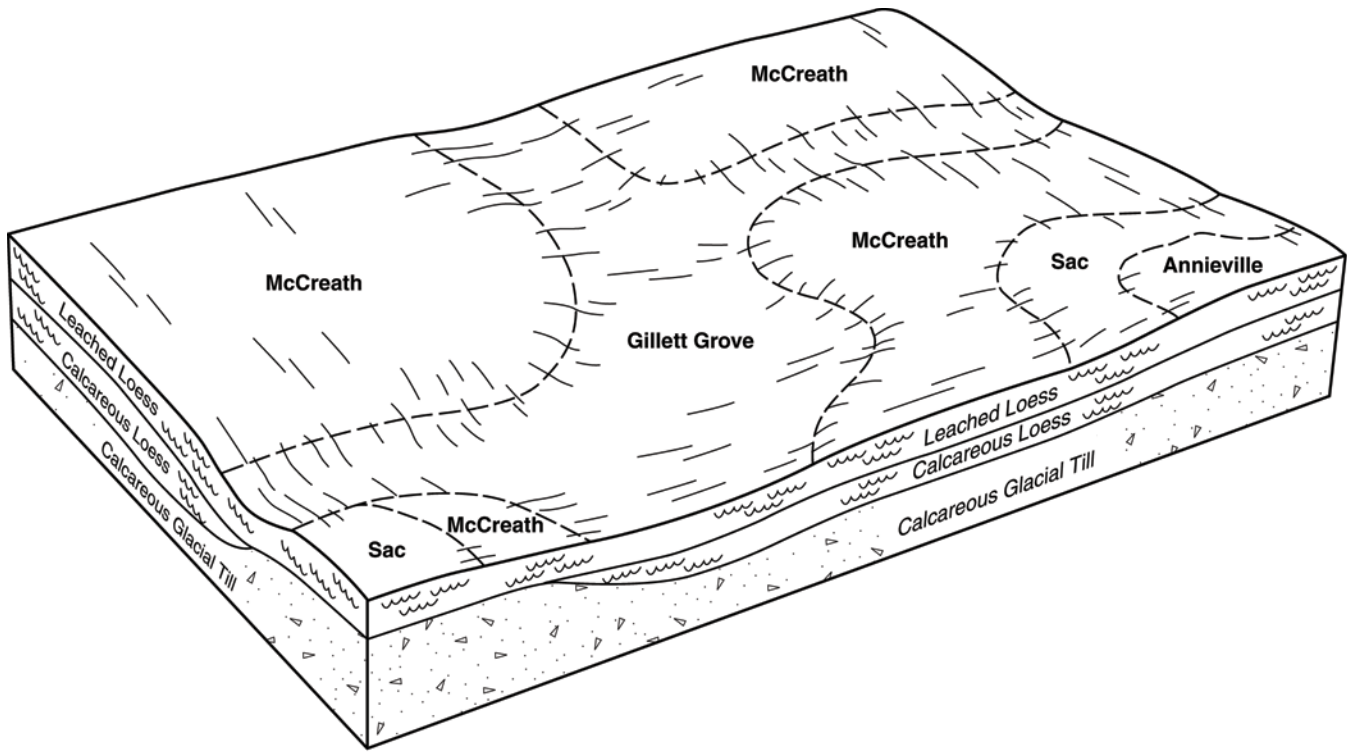


Figure 2.—Typical pattern of soils and underlying material in the McCreath-Gillett Grove-Sac association.

Composition

Extent of the association in the survey area: 20 percent
Extent of the components in the association:
Wilmonton soils—19 percent
Ransom soils—17 percent
Afton soils—10 percent
Soils of minor extent—54 percent

Soil Properties and Qualities

Wilmonton

Drainage class: Somewhat poorly drained
Landform and position on the landform: Broad upland flats
Slope range: 1 to 3 percent
Texture of the surface layer: Silty clay loam and clay loam

Ransom

Drainage class: Somewhat poorly drained
Landform and position on the landform: Broad upland flats
Slope range: 1 to 3 percent
Texture of the surface layer: Silty clay loam

Afton

Drainage class: Poorly drained
Landform and position on the landform: Upland drainageways
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam

Soils of Minor Extent

- Colo, Everly, Galva, Gillett Grove, McCreath, Moneta, and Sac soils

Use and Management

Major use: Cropland
Major management considerations: Wetness, maintaining fertility

3. Moneta-Cornell Association

Strongly sloping to very steep, well drained and moderately well drained, loamy and silty soils that formed in calcareous Wisconsin (Tazewell) till and in loess and loamy sediments overlying calcareous Wisconsin (Tazewell) till; on uplands

Setting

Landform and position on the landform: Side slopes in valleys
Slope range: 9 to 40 percent

Composition

Extent of the association in the survey area: 6 percent
Extent of the components in the association:
Moneta soils—64 percent
Cornell soils—1 percent
Soils of minor extent—35 percent

Soil Properties and Qualities

Moneta

Drainage class: Well drained
Slope range: 9 to 40 percent
Texture of the surface layer: Loam

Cornell

Drainage class: Moderately well drained
Slope range: 18 to 25 percent
Texture of the surface layer: Silty clay loam

Soils of Minor Extent

- Everly and Terril soils

Use and Management

Major uses: Cropland and pasture
Major management considerations: Moneta—erosion, calcareous surface layer, maintaining fertility; Cornell—erosion, maintaining fertility

4. Wadena-Cylinder-Biscay Association

Nearly level to gently sloping, well drained to poorly drained, loamy soils that formed in loamy alluvium underlain by sand and gravel; on stream terraces and outwash plains

Setting

Landform: Stream terraces and outwash plains
Slope range: 0 to 5 percent

Composition

Extent of the association in the survey area: 15 percent
Extent of the components in the association:
Wadena soils—41 percent
Cylinder soils—19 percent
Biscay soils—16 percent
Soils of minor extent—24 percent

Soil Properties and Qualities

Wadena

Drainage class: Well drained
Landform and position on the landform: Flats and risers on stream terraces
Slope range: 0 to 5 percent
Texture of the surface layer: Loam

Cylinder

Drainage class: Somewhat poorly drained
Landform: Stream terraces and outwash plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loam

Biscay

Drainage class: Poorly drained
Landform: Stream terraces and outwash plains
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam

Soils of Minor Extent

- Coland, Dickinson, Spillville, and Talcot soils

Use and Management

Major use: Cropland
Major management considerations: Wadena—erosion, droughtiness, maintaining fertility; Cylinder and Biscay—wetness, maintaining fertility

5. Colo-Zook-Spillville Association

Nearly level, somewhat poorly drained and poorly drained soils that formed in silty and loamy alluvium; on bottom land

Setting

Landform: Bottom land
Slope range: 0 to 2 percent

Composition

Extent of the association in the survey area: 4 percent
Extent of the components in the association:
Colo soils—24 percent
Zook soils—4 percent
Spillville soils—4 percent
Soils of minor extent—68 percent

Soil Properties and Qualities

Colo

Drainage class: Poorly drained
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam

Zook

Drainage class: Poorly drained
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam

Spillville

Drainage class: Somewhat poorly drained
Slope range: 0 to 2 percent
Texture of the surface layer: Loam

Soils of Minor Extent

- Calco soils and the channeled Coland and Colo soils

Use and Management

Major uses: Cropland and wetlands
Major management considerations: Colo—flooding, wetness; Zook—flooding, wetness, restricted permeability; Spillville—flooding (fig. 3)

6. Everly-Letri-Fostoria Association

Nearly level to strongly sloping, moderately well drained to poorly drained, loamy soils that formed in eolian material and pedisediments overlying till; on uplands

Setting

Position on the landform: Ridges and side slopes
Slope range: 0 to 14 percent

Figure 3.—Manmade drainage ditches help to lower the water table and control flooding on the nearly level flood plains in areas of the Colo-Zook-Spillville association.

Composition

Extent of the association in the survey area: 10 percent
Extent of the components in the association:
Everly soils—58 percent
Letri soils—32 percent
Fostoria soils—6 percent
Soils of minor extent—4 percent

Soil Properties and Qualities

Everly

Drainage class: Moderately well drained
Position on the landform: Summits of ridges and side slopes
Slope range: 2 to 14 percent
Texture of the surface layer: Clay loam

Letri

Drainage class: Poorly drained
Position on the landform: Flats
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam

Fostoria

Drainage class: Somewhat poorly drained
Position on the landform: Flats and low rises
Slope range: 1 to 3 percent
Texture of the surface layer: Loam

Soils of Minor Extent

- Dickinson, May City, and Ocheyedan soils

Use and Management

Major use: Cropland
Major management considerations: Everly—erosion, maintaining fertility; Letri and Fostoria—wetness, maintaining fertility

7. Clarion-Nicollet-Webster Association

Nearly level to moderately sloping, moderately well drained to poorly drained, loamy soils that formed in till or in local alluvium derived from till; on uplands (fig. 4)

Setting

Landform and position on the landform: Nearly level to moderately sloping upland flats; knolls and rises on glacial ground moraines
Slope range: 0 to 9 percent

Composition

Extent of the association in the survey area: 25 percent
Extent of the components in the association:
Clarion soils—40 percent
Nicollet soils—18 percent
Webster soils—15 percent
Soils of minor extent—27 percent

Soil Properties and Qualities

Clarion

Drainage class: Moderately well drained
Position on the landform: Knolls and rises
Slope range: 2 to 9 percent
Texture of the surface layer: Loam

Nicollet

Drainage class: Somewhat poorly drained
Position on the landform: Flats and slight rises
Slope range: 1 to 3 percent
Texture of the surface layer: Loam

Webster

Drainage class: Poorly drained
Position on the landform: Flats and swales
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam

Soils of Minor Extent

- Canisteo, Harps, Knoke, Okoboji, and Storden soils

Use and Management

Major use: Cropland
Major management considerations: Clarion—erosion, maintaining fertility; Nicollet—wetness, erosion, maintaining fertility; Webster—wetness, maintaining fertility

8. Belmann-Fostoria, lacustrine substratum-Waldorf Association

Nearly level to gently sloping, poorly drained and somewhat poorly drained, silty and loamy soils that formed in lacustrine sediments and in local alluvium overlying lacustrine sediments; on glacial lake plains

Setting

Landform: Glacial lake plains
Slope range: 0 to 3 percent

Composition

Extent of the association in the survey area: 3 percent
Extent of the components in the association:
Belmann soils—24 percent
Fostoria, lacustrine substratum—20 percent

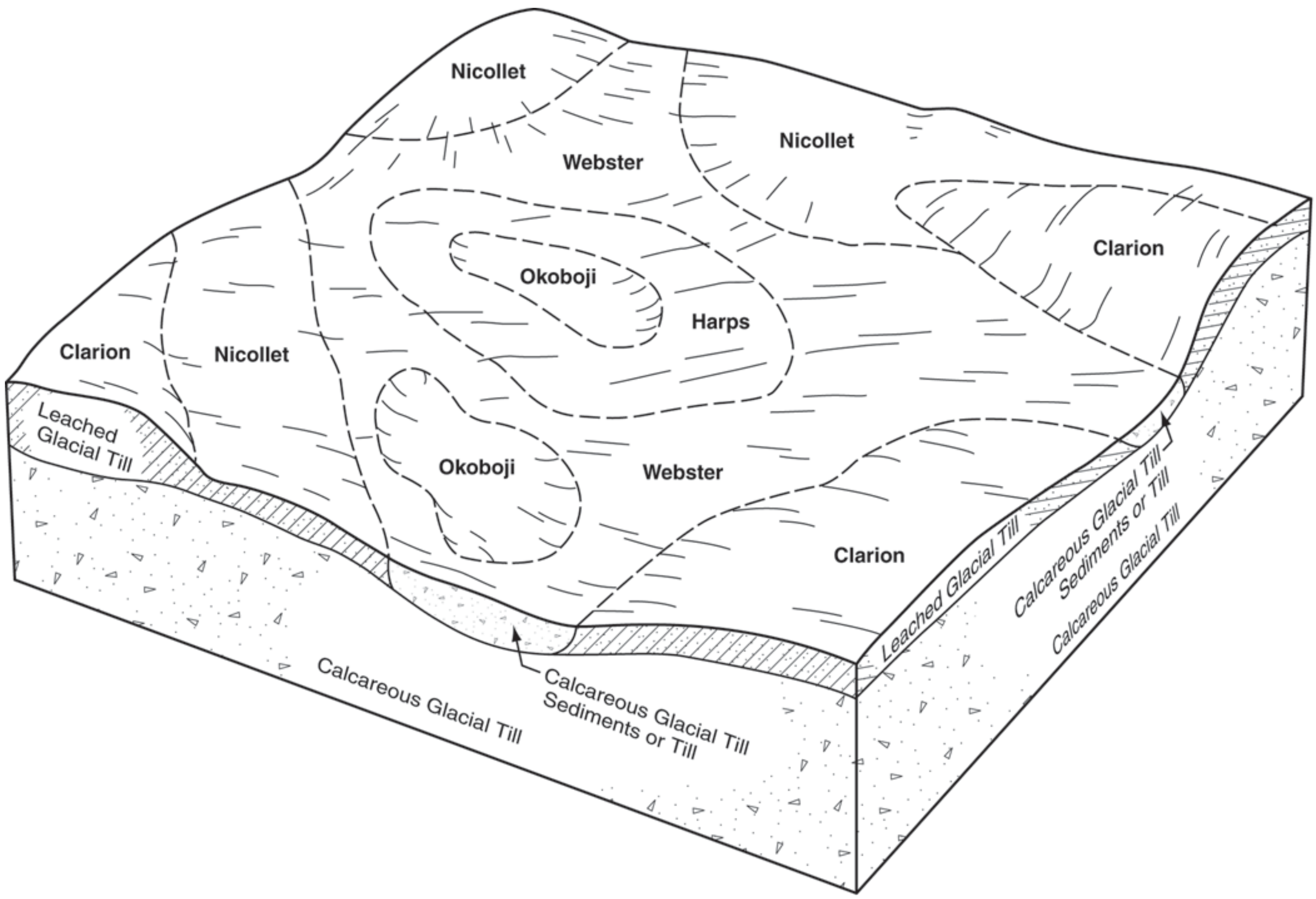


Figure 4.—Typical pattern of soils and underlying material in the Clarion-Nicollet-Webster association.

Waldorf soils—19 percent
Soils of minor extent—37 percent

Soil Properties and Qualities

Belmann

Drainage class: Poorly drained
Position on the landform: Flats
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam

Fostoria, lacustrine substratum

Drainage class: Somewhat poorly drained
Position on the landform: Flats and low rises
Slope range: 1 to 3 percent
Texture of the surface layer: Clay loam

Waldorf

Drainage class: Poorly drained
Position on the landform: Flats and swales
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay

Soils of Minor Extent

- Belmann, gypsum phase; Dickinson and Ocheyedan soils that have a lacustrine substratum; and Ocheda soils

Use and Management

Major use: Cropland
Major management considerations: Belmann—wetness, gypsum, maintaining fertility; Fostoria and Waldorf—wetness, maintaining fertility

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. 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 other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties 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, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The contrasting additional components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal soil properties and features 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, 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, slope, stoniness, salinity, 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, Fostoria clay loam, lacustrine substratum, 1 to 3 percent slopes, is a phase of the Fostoria series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes. A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Clarion-Storden complex, 5 to 9 percent slopes, moderately eroded, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, sand and gravel, is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other 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 or miscellaneous areas.

6—Okoboji silty clay loam, depressional, 0 to 1 percent slopes

Component Description

Okoboji and similar soils

Extent: 70 to 90 percent of the unit
Geomorphic setting: Depressions on ground moraines
Slope range: 0 to 1 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Silty alluvium washed from till
Flooding: None
Seasonal high water table (in undrained areas): 1 foot above to 1 foot below the surface
Available water capacity to a depth of 60 inches: 12.3 inches
Content of organic matter in the upper 10 inches: 8.3 percent

Additional Components

Knoke soils: 5 to 10 percent of the unit
Harps soils: 3 to 7 percent of the unit
Okoboji mucky silty clay loam: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

27B—Terril loam, 2 to 5 percent slopes

Component Description

Terril and similar soils

Extent: 70 to 90 percent of the unit
Geomorphic setting: Drainageways, alluvial fans
Slope range: 2 to 5 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Local loamy alluvium and/or colluvium
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 3.4 percent

Additional Components

Spillville soils: 5 to 15 percent of the unit
Clarion soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

27C—Terril loam, 5 to 9 percent slopes

Component Description

Terril and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Drainageways, alluvial fans
Slope range: 5 to 9 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Local loamy alluvium and/or colluvium
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 3.4 percent

Additional Components

Spillville soils: 5 to 15 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

27D—Terril loam, 9 to 14 percent slopes

Component Description

Terril and similar soils

Extent: 65 to 85 percent of the unit
Geomorphic setting: Drainageways
Slope range: 9 to 14 percent

Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Local loamy alluvium and/or colluvium
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 3.4 percent

Additional Components

Coland soils: 0 to 10 percent of the unit
Spillville soils: 5 to 15 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

31—Afton silty clay loam, 0 to 2 percent slopes

Component Description

Afton and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Drainageways on uplands
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loess and alluvium overlying till
Flooding: None
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 10.4 inches
Content of organic matter in the upper 10 inches: 5.8 percent

Additional Components

Afton, frequently flooded: 5 to 15 percent of the unit
Gillett Grove soils: 5 to 10 percent of the unit
McCreath soils: 0 to 5 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

34B—Estherville sandy loam, 2 to 5 percent slopes

Component Description

Estherville and similar soils

Extent: 70 to 90 percent of the unit
Geomorphic setting: Ground moraines
Slope range: 2 to 5 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Parent material: Loamy sediments over sand and gravel
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 4.1 inches
Content of organic matter in the upper 10 inches: 1.6 percent

Additional Components

Hawick soils: 5 to 15 percent of the unit
Wadena soils: 5 to 15 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

41C—Sparta loamy sand, 5 to 9 percent slopes

Component Description

Sparta and similar soils

Extent: 80 to 95 percent of the unit
Geomorphic setting: Hillslopes on uplands
Slope range: 5 to 9 percent
Texture of the surface layer: Loamy sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Eolian sediments
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 4.2 inches

Content of organic matter in the upper 10 inches: 1.5 percent

Additional Components

Dickinson soils: 0 to 15 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

48—Knoke mucky silty clay loam, depressional, 0 to 1 percent slopes

Component Description

Knoke and similar soils

Extent: 80 to 90 percent of the unit
Geomorphic setting: Depressions on ground moraines
Slope range: 0 to 1 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Silty alluvium washed from till
Flooding: None
Seasonal high water table (in undrained areas): 1 foot above to 1 foot below the surface
Available water capacity to a depth of 60 inches: 12.5 inches
Content of organic matter in the upper 10 inches: 8.6 percent

Additional Components

Knoke silty clay loam: 0 to 15 percent of the unit
Harps soils: 5 to 15 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

54—Zook silty clay loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Zook and similar soils

Extent: 70 to 90 percent of the unit
Geomorphic setting: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Silty alluvium
Frequency of flooding: Occasional
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 9.2 inches
Content of organic matter in the upper 10 inches: 5.4 percent

Additional Components

Coland soils: 5 to 15 percent of the unit
Colo soils: 0 to 10 percent of the unit
Spillville soils: 5 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

55—Nicollet loam, 1 to 3 percent slopes

Component Description

Nicollet and similar soils

Extent: 60 to 90 percent of the unit
Geomorphic setting: Rises on ground moraines
Slope range: 1 to 3 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Till
Flooding: None
Depth to seasonal high water table (in undrained areas): 1.0 to 3.5 feet
Available water capacity to a depth of 60 inches: 10.9 inches
Content of organic matter in the upper 10 inches: 5.5 percent

Additional Components

Clarion soils: 5 to 12 percent of the unit
Crippin soils: 0 to 10 percent of the unit
Rolfe soils: 0 to 10 percent of the unit
Webster soils: 0 to 7 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

62F—Storden loam, 18 to 25 percent slopes

Component Description

Storden and similar soils

Extent: 65 to 90 percent of the unit
Geomorphic setting: Ground moraines
Slope range: 18 to 25 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Calcareous till
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 11 inches
Content of organic matter in the upper 10 inches: 2.4 percent

Additional Components

Sunburg soils: 5 to 15 percent of the unit
Omsrud, moderately eroded: 5 to 10 percent of the unit
Terril soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Hayland and pasture (fig. 5)

77B—Sac silty clay loam, 2 to 5 percent slopes

Component Description

Sac and similar soils

Extent: 80 to 95 percent of the unit
Geomorphic setting: Ridges on uplands
Slope range: 2 to 5 percent

Figure 5.—Livestock pasture in an area of Storden loam, 18 to 25 percent slopes.

Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loess overlying till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 3.6 percent

Additional Components

Annieville soils: 5 to 12 percent of the unit
McCreath soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

77C—Sac silty clay loam, 5 to 9 percent slopes

Component Description

Sac and similar soils

Extent: 77 to 90 percent of the unit
Geomorphic setting: Hillslopes on uplands
Slope range: 5 to 9 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loess overlying till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 3.6 percent

Additional Components

Annieville soils: 5 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

77C2—Sac silty clay loam, 5 to 9 percent slopes, moderately eroded

Component Description

Sac, moderately eroded, and similar soils

Extent: 70 to 90 percent of the unit
Geomorphic setting: Hillslopes on uplands
Slope range: 5 to 9 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loess overlying till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11 inches
Content of organic matter in the upper 10 inches: 2.6 percent

Additional Components

Annieville soils: 0 to 10 percent of the unit
McCreath soils: 5 to 15 percent of the unit
Ransom soils: 0 to 5 percent of the unit
Sac soils that are only slightly eroded: 5 to 15 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

90—Okoboji mucky silty clay loam, depressional, 0 to 1 percent slopes

Component Description

Okoboji mucky silty clay loam and similar soils

Extent: 80 to 90 percent of the unit
Geomorphic setting: Depressions on ground moraines
Slope range: 0 to 1 percent
Texture of the surface layer: Mucky silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Silty alluvium washed from till
Flooding: None
Seasonal high water table (in undrained areas): 1 foot above to 1 foot below the surface

Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 13.7 percent

Additional Components

Harps soils: 5 to 10 percent of the unit
Knoke soils: 0 to 10 percent of the unit
Okoboji silty clay loam: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

95—Harps loam, 0 to 2 percent slopes

Component Description

Harps and similar soils

Extent: 70 to 95 percent of the unit
Geomorphic setting: Rims of depressions on ground moraines
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Calcareous till or till-derived sediments
Flooding: None
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 10.9 inches
Content of organic matter in the upper 10 inches: 4.7 percent

Additional Components

Canisteo soils: 5 to 10 percent of the unit
Crippin soils: 0 to 10 percent of the unit
Okoboji soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

107—Webster silty clay loam, 0 to 2 percent slopes

Component Description

Webster and similar soils

Extent: 70 to 90 percent of the unit
Geomorphic setting: Swales on ground moraines; flats on ground moraines
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Calcareous till or till-derived sediments
Flooding: None
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 10.9 inches
Content of organic matter in the upper 10 inches: 6.1 percent

Additional Components

Canisteo soils: 5 to 15 percent of the unit
Nicollet soils: 5 to 10 percent of the unit
Okoboji soils: 0 to 5 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

108—Wadena loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes

Component Description

Wadena and similar soils

Extent: 60 to 85 percent of the unit
Geomorphic setting: Outwash plains, stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy sediments over sand or gravel (fig. 6)
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 5.9 inches
Content of organic matter in the upper 10 inches: 3.2 percent

Additional Components

Wadena soils that are 32 to 40 inches to sand and gravel: 10 to 20 percent of the unit
Cylinder soils: 5 to 10 percent of the unit
Estherville soils: 0 to 10 percent of the unit

Figure 6.—Areas of Wadena loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes, provide an economical source of sand and gravel.

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

108B—Wadena loam, 24 to 32 inches to sand and gravel, 2 to 5 percent slopes

Component Description

Wadena and similar soils

Extent: 70 to 90 percent of the unit
Geomorphic setting: Outwash plains, stream terraces
Slope range: 2 to 5 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy sediments over sand or gravel
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 5.7 inches
Content of organic matter in the upper 10 inches: 3.2 percent

Additional Components

Wadena soils that are 32 to 40 inches to sand and gravel: 5 to 15 percent of the unit
Ridgeport soils: 5 to 10 percent of the unit
Wadena soils that have slopes of 0 to 2 percent: 5 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

133—Colo silty clay loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Colo and similar soils

Extent: 60 to 90 percent of the unit
Geomorphic setting: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Silty alluvium
Frequency of flooding: Occasional
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 12.4 inches
Content of organic matter in the upper 10 inches: 5.7 percent

Additional Components

Zook soils: 5 to 15 percent of the unit
Spillville soils: 0 to 15 percent of the unit
Calco soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

135—Coland clay loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Coland and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy alluvium
Frequency of flooding: Occasional
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 11.4 inches
Content of organic matter in the upper 10 inches: 5.7 percent

Additional Components

Spillville soils: 5 to 15 percent of the unit
Havelock soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

138B—Clarion loam, 2 to 5 percent slopes

Component Description

Clarion and similar soils

Extent: 60 to 95 percent of the unit
Geomorphic setting: Ground moraines
Slope range: 2 to 5 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 3.2 percent

Additional Components

Nicollet soils: 5 to 15 percent of the unit
Clarion, moderately eroded: 0 to 10 percent of the unit
Storden soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

138C2—Clarion loam, 5 to 9 percent slopes, moderately eroded

Component Description

Clarion, moderately eroded, and similar soils

Extent: 65 to 90 percent of the unit
Geomorphic setting: Ground moraines
Slope range: 5 to 9 percent

Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 2.4 percent

Additional Components

Clarion soils that are only slightly eroded: 5 to 15 percent of the unit
Terril soils: 5 to 10 percent of the unit
Storden soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

175—Dickinson fine sandy loam, 0 to 2 percent slopes

Component Description

Dickinson and similar soils

Extent: 80 to 95 percent of the unit
Geomorphic setting: Stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Parent material: Eolian sediments
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 5.4 inches
Content of organic matter in the upper 10 inches: 2.5 percent

Additional Components

Dickman soils: 5 to 10 percent of the unit
Ridgeport soils: 5 to 15 percent of the unit
Wadena soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

175B—Dickinson fine sandy loam, 2 to 5 percent slopes

Component Description

Dickinson and similar soils

Extent: 65 to 90 percent of the unit
Geomorphic setting: Stream terraces, uplands
Slope range: 2 to 5 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Parent material: Eolian sediments
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 5.4 inches
Content of organic matter in the upper 10 inches: 1.9 percent

Additional Components

Dickman soils: 5 to 20 percent of the unit
Ridgeport soils: 5 to 15 percent of the unit
Wadena soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

191—Rushmore silty clay loam, 0 to 2 percent slopes

Component Description

Rushmore and similar soils

Extent: 70 to 95 percent of the unit
Geomorphic setting: Flats on uplands
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loess over till
Flooding: None
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 11 inches
Content of organic matter in the upper 10 inches: 6 percent

Additional Components

Ransom soils: 5 to 15 percent of the unit
Gillett Grove soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

201B—Coland-Terril complex, 1 to 5 percent slopes

Component Description

Coland and similar soils

Extent: 50 to 57 percent of the unit
Geomorphic setting: Drainageways
Slope range: 1 to 3 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy alluvium
Frequency of flooding: Occasional
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 11.4 inches
Content of organic matter in the upper 10 inches: 5.7 percent

Terril and similar soils

Extent: 30 to 38 percent of the unit
Geomorphic setting: Alluvial fans, drainageways
Slope range: 2 to 5 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Local loamy alluvium and/or colluvium
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Additional Components

Spillville soils: 5 to 15 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

202—Cylinder loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes

Component Description

Cylinder, 24 to 32 inches to sand and gravel, and similar soils

Extent: 65 to 90 percent of the unit
Geomorphic setting: Stream terraces, outwash plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy sediments over sand and gravel
Flooding: None
Depth to seasonal high water table (in undrained areas): 1.0 to 3.5 feet
Available water capacity to a depth of 60 inches: 6.2 inches
Content of organic matter in the upper 10 inches: 4.1 percent

Additional Components

Biscay soils that are 24 to 32 inches to sand and gravel: 5 to 15 percent of the unit
Cylinder soils that are 32 to 40 inches to sand and gravel: 5 to 15 percent of the unit
Wadena soils that are 24 to 32 inches to sand and gravel: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

203—Cylinder loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes

Component Description

Cylinder, 32 to 40 inches to sand and gravel, and similar soils

Extent: 65 to 90 percent of the unit
Geomorphic setting: Stream terraces, outwash plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy sediments over sand and gravel
Flooding: None

Depth to seasonal high water table (in undrained areas): 1.0 to 3.5 feet
Available water capacity to a depth of 60 inches: 6.5 inches
Content of organic matter in the upper 10 inches: 4.1 percent

Additional Components

Biscay soils that are 32 to 40 inches to sand and gravel: 5 to 15 percent of the unit
Cylinder soils that are 24 to 32 inches to sand and gravel: 5 to 15 percent of the unit
Wadena soils that are 24 to 32 inches to sand and gravel: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

221—Klossner muck, depressional, 0 to 1 percent slopes

Component Description

Klossner and similar soils

Extent: 80 to 95 percent of the unit
Geomorphic setting: Depressions on ground moraines
Slope range: 0 to 1 percent
Texture of the surface layer: Muck
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Well decomposed organic material and the underlying loamy material
Flooding: None
Seasonal high water table (in undrained areas): 1 foot above to 1 foot below the surface
Available water capacity to a depth of 60 inches: 16.5 inches
Content of organic matter in the upper 10 inches: 35 percent

Additional Components

Harps soils: 5 to 10 percent of the unit
Okoboji soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Wildlife habitat

259—Biscay clay loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes

Component Description

Biscay and similar soils

Extent: 55 to 85 percent of the unit
Geomorphic setting: Stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy sediments over sand and gravel
Flooding: None
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 7.8 inches
Content of organic matter in the upper 10 inches: 5.6 percent

Additional Components

Biscay soils that are 24 to 32 inches to sand and gravel: 10 to 20 percent of the unit
Cylinder soils: 5 to 15 percent of the unit
Biscay, depressional: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

274—Rolfe silt loam, depressional, 0 to 1 percent slopes

Component Description

Rolfe and similar soils

Extent: 70 to 90 percent of the unit
Geomorphic setting: Depressions on ground moraines
Slope range: 0 to 1 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Till-derived sediments and till
Flooding: None
Seasonal high water table (in undrained areas): 1 foot above to 1 foot below the surface

Available water capacity to a depth of 60 inches: 9.6 inches
Content of organic matter in the upper 10 inches: 5 percent

Additional Components

Webster soils: 5 to 15 percent of the unit
Okoboji soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

282—Ransom silty clay loam, 1 to 3 percent slopes

Component Description

Ransom and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Rises on uplands
Slope range: 1 to 3 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess over till
Flooding: None
Depth to seasonal high water table (in undrained areas): 1.0 to 3.5 feet
Available water capacity to a depth of 60 inches: 11.9 inches
Content of organic matter in the upper 10 inches: 4.4 percent

Additional Components

McCreath soils: 5 to 15 percent of the unit
Gillett Grove soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

308—Wadena loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes

Component Description

Wadena, 32 to 40 inches to sand and gravel, and similar soils

Extent: 60 to 85 percent of the unit
Geomorphic setting: Stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy sediments over sand or gravel
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 7.1 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Additional Components

Wadena soils that are 24 to 32 inches to sand and gravel: 10 to 20 percent of the unit
Cylinder soils that are 32 to 40 inches to sand and gravel: 5 to 10 percent of the unit
Ridgeport soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

308B—Wadena loam, 32 to 40 inches to sand and gravel, 2 to 5 percent slopes

Component Description

Wadena, 32 to 40 inches to sand and gravel, and similar soils

Extent: 65 to 90 percent of the unit
Geomorphic setting: Stream terraces
Slope range: 2 to 5 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy sediments over sand or gravel
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 6.9 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Additional Components

Wadena soils that are 24 to 32 inches to sand and gravel: 10 to 12 percent of the unit
Cylinder soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

354—Aquolls (marsh), ponded, 0 to 1 percent slopes

Component Description

Aquolls (marsh), ponded, and similar soils

Extent: 65 to 95 percent of the unit
Geomorphic setting: Depressions on ground moraines
Slope range: 0 to 1 percent
Texture of the surface layer: Various textures
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Alluvium
Flooding: None
Seasonal high water table (in undrained areas): 1 foot above to 1 foot below the surface

Additional Components

Harps soils: 5 to 15 percent of the unit
Klossner soils: 0 to 10 percent of the unit
Okoboji soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Wildlife habitat

375—Fostoria clay loam, lacustrine substratum, 1 to 3 percent slopes

Component Description

Fostoria, lacustrine substratum, and similar soils

Extent: 70 to 90 percent of the unit
Geomorphic setting: Rises in relict glacial lakes
Slope range: 1 to 3 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy sediments over lacustrine sediments
Flooding: None
Depth to seasonal high water table (in undrained areas): 1.0 to 3.5 feet
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 5.2 percent

Additional Components

Belmann soils: 5 to 10 percent of the unit
Dickman soils: 5 to 10 percent of the unit
Dickinson, lacustrine substratum: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

376F—Cornell silty clay loam, 18 to 25 percent slopes

Component Description

Cornell and similar soils

Extent: 60 to 85 percent of the unit
Geomorphic setting: Hillslopes on uplands
Slope range: 18 to 25 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy and silty sediments overlying till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.2 inches
Content of organic matter in the upper 10 inches: 2.3 percent

Additional Components

Moneta soils: 5 to 15 percent of the unit
Everly, moderately eroded: 5 to 10 percent of the unit
Terril soils: 5 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Hayland and pasture

379—Ocheyedan clay loam, lacustrine substratum, 0 to 2 percent slopes

Component Description

Ocheyedan, lacustrine substratum, and similar soils

Extent: 65 to 90 percent of the unit
Geomorphic setting: Flats in relict glacial lakes
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam

Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments overlying lacustrine sediments
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 3.2 percent

Additional Components

Dickinson, lacustrine substratum: 5 to 10 percent of the unit
Fostoria, lacustrine substratum: 5 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

379B—Ocheyedan clay loam, lacustrine substratum, 2 to 5 percent slopes

Component Description

Ocheyedan, lacustrine substratum, and similar soils

Extent: 70 to 90 percent of the unit
Geomorphic setting: Rises in relict glacial lakes
Slope range: 2 to 5 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments overlying lacustrine sediments
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 3.2 percent

Additional Components

Dickinson, lacustrine substratum: 5 to 10 percent of the unit
Fostoria, lacustrine substratum: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

379C2—Ocheyedan clay loam, lacustrine substratum, 5 to 9 percent slopes, moderately eroded

Component Description

Ocheyedan, lacustrine substratum, moderately eroded, and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Rises in relict glacial lakes
Slope range: 5 to 9 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments overlying lacustrine sediments
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.1 inches
Content of organic matter in the upper 10 inches: 2.4 percent

Additional Components

Dickinson, lacustrine substratum, moderately eroded: 5 to 15 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

384—Collinwood clay, 1 to 3 percent slopes

Component Description

Collinwood and similar soils

Extent: 70 to 90 percent of the unit
Geomorphic setting: Rises in relict glacial lakes
Slope range: 1 to 3 percent
Texture of the surface layer: Clay
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Lacustrine sediments

Flooding: None
Depth to seasonal high water table (in undrained areas): 1.0 to 3.5 feet
Available water capacity to a depth of 60 inches: 8.6 inches
Content of organic matter in the upper 10 inches: 5.4 percent

Additional Components

Guckeen soils: 5 to 15 percent of the unit
Waldorf soils: 5 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

390—Waldorf silty clay, 0 to 2 percent slopes

Component Description

Waldorf and similar soils

Extent: 75 to 90 percent of the unit
Geomorphic setting: Flats in relict glacial lakes
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Lacustrine sediments
Flooding: None
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 6.8 percent

Additional Components

Belmann soils: 5 to 15 percent of the unit
Collinwood soils: 5 to 15 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

397—Letri clay loam, 0 to 2 percent slopes

Component Description

Letri and similar soils

Extent: 80 to 95 percent of the unit
Geomorphic setting: Ground moraines
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy sediments over till
Flooding: None
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 11 inches
Content of organic matter in the upper 10 inches: 5.4 percent

Additional Components

Wilmonton soils: 5 to 15 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

433E—Moneta clay loam, 14 to 18 percent slopes

Component Description

Moneta and similar soils

Extent: 60 to 90 percent of the unit
Geomorphic setting: Hillslopes on uplands
Slope range: 14 to 18 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Calcareous till
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 10.3 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Additional Components

Everly, moderately eroded: 5 to 15 percent of the unit
Terril soils: 5 to 10 percent of the unit
Sac, moderately eroded: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Hayland and pasture

433F—Moneta clay loam, 18 to 25 percent slopes

Component Description

Moneta and similar soils

Extent: 60 to 90 percent of the unit
Geomorphic setting: Hillslopes on uplands
Slope range: 18 to 25 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Calcareous till
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 10.3 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Additional Components

Everly, moderately eroded: 5 to 15 percent of the unit
Terril soils: 5 to 15 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Pasture

433G—Moneta clay loam, 25 to 40 percent slopes

Component Description

Moneta and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Hillslopes on uplands
Slope range: 25 to 40 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Calcareous till
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 10.3 inches
Content of organic matter in the upper 10 inches: 3.3 percent

Additional Components

Terril soils: 5 to 15 percent of the unit
Everly, moderately eroded: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Pasture

455—Wilmonton clay loam, 1 to 3 percent slopes

Component Description

Wilmonton and similar soils

Extent: 80 to 95 percent of the unit
Geomorphic setting: Flats on uplands
Slope range: 1 to 3 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy pedisediments over till
Flooding: None
Depth to seasonal high water table (in undrained areas): 1.0 to 3.5 feet
Available water capacity to a depth of 60 inches: 11.2 inches
Content of organic matter in the upper 10 inches: 5.6 percent

Additional Components

Everly soils: 5 to 10 percent of the unit
Letri soils: 5 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

456—Wilmonton silty clay loam, 1 to 3 percent slopes

Component Description

Wilmonton and similar soils

Extent: 80 to 95 percent of the unit
Geomorphic setting: Rises on uplands
Slope range: 1 to 3 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy pedisediments over till
Flooding: None
Depth to seasonal high water table (in undrained areas): 1.0 to 3.5 feet
Available water capacity to a depth of 60 inches: 11 inches

Content of organic matter in the upper 10 inches: 5.2 percent

Additional Components

Everly soils: 5 to 10 percent of the unit
Rushmore soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

485—Spillville loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Spillville and similar soils

Extent: 60 to 90 percent of the unit
Geomorphic setting: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy alluvium
Frequency of flooding: Occasional
Depth to seasonal high water table (in undrained areas): 1.0 to 3.5 feet
Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 4.5 percent

Additional Components

Coland soils: 5 to 15 percent of the unit
Hanlon soils: 0 to 15 percent of the unit
Havelock soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

506—Wacousta silty clay loam, depressional, 0 to 1 percent slopes

Component Description

Wacousta and similar soils

Extent: 70 to 95 percent of the unit
Geomorphic setting: Depressions on ground moraines
Slope range: 0 to 1 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Silty lacustrine sediments
Flooding: None
Seasonal high water table (in undrained areas): 1 foot above to 1 foot below the surface
Available water capacity to a depth of 60 inches: 12.7 inches
Content of organic matter in the upper 10 inches: 8.9 percent

Additional Components

Calcousta soils: 5 to 10 percent of the unit
Harps soils: 0 to 10 percent of the unit
Klossner soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

507—Canisteo clay loam, 0 to 2 percent slopes

Component Description

Canisteo and similar soils

Extent: 55 to 90 percent of the unit
Geomorphic setting: Flats on ground moraines
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Calcareous till or till-derived sediments
Flooding: None
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 10.9 inches
Content of organic matter in the upper 10 inches: 6.5 percent

Additional Components

Webster soils: 5 to 15 percent of the unit
Crippin soils: 0 to 10 percent of the unit
Harps soils: 5 to 10 percent of the unit
Okoboji soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

541C—Estherville-Hawick complex, 5 to 9 percent slopes

Component Description

Estherville and similar soils

Extent: 40 to 80 percent of the unit
Geomorphic setting: Ground moraines, outwash plains
Slope range: 5 to 9 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Parent material: Loamy sediments over sand and gravel
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 4.1 inches
Content of organic matter in the upper 10 inches: 1.2 percent

Hawick and similar soils

Extent: 40 to 80 percent of the unit
Geomorphic setting: Ground moraines, outwash plains
Slope range: 5 to 9 percent
Texture of the surface layer: Gravelly loamy sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy outwash sediments
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 3.2 inches
Content of organic matter in the upper 10 inches: 1.9 percent

Additional Components

Terril soils: 5 to 15 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

559—Talcot clay loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes

Component Description

Talcot and similar soils

Extent: 65 to 90 percent of the unit
Geomorphic setting: Stream terraces, outwash plains
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy sediments over sand and gravel
Flooding: None
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 6.8 inches
Content of organic matter in the upper 10 inches: 6 percent

Additional Components

Talcot soils that are 24 to 32 inches to sand and gravel: 5 to 15 percent of the unit
Biscay, depressional: 0 to 10 percent of the unit
Cylinder soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

577B—Everly clay loam, 2 to 5 percent slopes

Component Description

Everly and similar soils

Extent: 70 to 90 percent of the unit
Geomorphic setting: Ridges on uplands
Slope range: 2 to 5 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 10.5 inches
Content of organic matter in the upper 10 inches: 3.4 percent

Additional Components

Everly, moderately eroded: 5 to 15 percent of the unit
Wilmonton soils: 5 to 10 percent of the unit
Sac soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

577C2—Everly clay loam, 5 to 9 percent slopes, moderately eroded

Component Description

Everly, moderately eroded, and similar soils

Extent: 60 to 95 percent of the unit
Geomorphic setting: Hillslopes on uplands
Slope range: 5 to 9 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 10.4 inches
Content of organic matter in the upper 10 inches: 2.2 percent

Additional Components

Everly soils that are only slightly eroded: 10 to 20 percent of the unit
Sac, moderately eroded: 0 to 10 percent of the unit
Terril soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

637D2—Everly-Moneta complex, 9 to 14 percent slopes, moderately eroded

Component Description

Everly, moderately eroded, and similar soils

Extent: 30 to 55 percent of the unit
Geomorphic setting: Hillslopes on uplands
Slope range: 9 to 14 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 10.4 inches
Content of organic matter in the upper 10 inches: 2.2 percent

Moneta, moderately eroded, and similar soils

Extent: 30 to 50 percent of the unit
Geomorphic setting: Hillslopes on uplands
Slope range: 9 to 14 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Calcareous till
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 10.2 inches
Content of organic matter in the upper 10 inches: 2.9 percent

Additional Components

Terril soils: 5 to 15 percent of the unit
Sac, moderately eroded: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

638C2—Clarion-Storden complex, 5 to 9 percent slopes, moderately eroded

Component Description

Clarion, moderately eroded, and similar soils

Extent: 48 to 58 percent of the unit
Geomorphic setting: Ground moraines
Slope range: 5 to 9 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.8 inches
Content of organic matter in the upper 10 inches: 2.2 percent

Storden, moderately eroded, and similar soils

Extent: 30 to 39 percent of the unit

Geomorphic setting: Ground moraines
Slope range: 5 to 9 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Calcareous till
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 11 inches
Content of organic matter in the upper 10 inches: 1.5 percent

Additional Components

Clarion soils that are only slightly eroded: 0 to 10 percent of the unit
Sunburg, moderately eroded: 0 to 10 percent of the unit
Terril soils: 3 to 7 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

672—May City sandy clay loam, 0 to 2 percent slopes

Component Description

May City and similar soils

Extent: 80 to 95 percent of the unit
Geomorphic setting: Flats on uplands; outwash plains
Slope range: 0 to 2 percent
Texture of the surface layer: Sandy clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Parent material: Gravelly and loamy material
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 3.9 inches
Content of organic matter in the upper 10 inches: 2.4 percent

Additional Components

Dickinson soils: 0 to 15 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

672B—May City sandy clay loam, 2 to 5 percent slopes

Component Description

May City and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Ridges on uplands; outwash plains
Slope range: 2 to 5 percent
Texture of the surface layer: Sandy clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Parent material: Gravelly and loamy material
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 3.9 inches
Content of organic matter in the upper 10 inches: 2.4 percent

Additional Components

Hawick soils: 0 to 12 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

672C2—May City sandy clay loam, 5 to 9 percent slopes, moderately eroded

Component Description

May City, moderately eroded, and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Hillslopes on uplands; outwash plains
Slope range: 5 to 9 percent
Texture of the surface layer: Sandy clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Parent material: Gravelly and loamy material
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 3.7 inches
Content of organic matter in the upper 10 inches: 2 percent

Additional Components

Hawick soils: 5 to 12 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

709—Fairhaven silt loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes

Component Description

Fairhaven and similar soils

Extent: 65 to 90 percent of the unit
Geomorphic setting: Stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Silt loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Silty sediments over sand and gravel
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 7.7 inches
Content of organic matter in the upper 10 inches: 4.3 percent

Additional Components

Fairhaven soils that are 24 to 32 inches to sand and gravel: 10 to 12 percent of the unit
Cylinder soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

733—Calco silty clay loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Calco and similar soils

Extent: 70 to 95 percent of the unit
Geomorphic setting: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Calcareous silty alluvium
Frequency of flooding: Occasional
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 12.4 inches
Content of organic matter in the upper 10 inches: 5.9 percent

Additional Components

Colo soils: 5 to 15 percent of the unit
Spillville soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

735—Havelock clay loam, 0 to 2 percent slopes, occasionally flooded

Component Description

Havelock and similar soils

Extent: 70 to 90 percent of the unit
Geomorphic setting: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy calcareous alluvium
Frequency of flooding: Occasional
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 11.4 inches
Content of organic matter in the upper 10 inches: 5.7 percent

Additional Components

Coland soils: 5 to 15 percent of the unit
Spillville soils: 5 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

740D—Hawick gravelly loamy sand, 9 to 14 percent slopes

Component Description

Hawick and similar soils

Extent: 60 to 100 percent of the unit

Geomorphic setting: Ground moraines, outwash plains
Position on the landform: Backslopes, risers
Slope range: 9 to 14 percent
Texture of the surface layer: Gravelly loamy sand
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Excessively drained
Parent material: Sandy outwash sediments
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 3.2 inches
Content of organic matter in the upper 10 inches: 1.9 percent

Additional Components

Estherville soils: 5 to 15 percent of the unit
Dickman soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

810—Galva silty clay loam, terrace, 0 to 2 percent slopes

Component Description

Galva, terrace, and similar soils

Extent: 70 to 95 percent of the unit
Geomorphic setting: Treads on stream terraces
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess overlying sand and gravel outwash
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 12.2 inches
Content of organic matter in the upper 10 inches: 4.1 percent

Additional Components

Primghar soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

810B—Galva silty clay loam, terrace, 2 to 5 percent slopes

Component Description

Galva, terrace, and similar soils

Extent: 100 percent of the unit
Geomorphic setting: Risers on stream terraces
Slope range: 2 to 5 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loess overlying sand and gravel outwash
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 12.2 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

828B—Zenor sandy loam, 2 to 5 percent slopes

Component Description

Zenor and similar soils

Extent: 80 to 95 percent of the unit
Geomorphic setting: Ground moraines
Slope range: 2 to 5 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Parent material: Glacial outwash
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 3.9 inches
Content of organic matter in the upper 10 inches: 1.7 percent

Additional Components

Sunburg soils: 5 to 10 percent of the unit
Clarion soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

828C2—Zenor sandy loam, 5 to 9 percent slopes, moderately eroded

Component Description

Zenor, moderately eroded, and similar soils

Extent: 70 to 85 percent of the unit
Geomorphic setting: Ground moraines
Slope range: 5 to 9 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Parent material: Glacial outwash
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 3.7 inches
Content of organic matter in the upper 10 inches: 1.3 percent

Additional Components

Clarion, moderately eroded: 5 to 10 percent of the unit
Sunburg soils: 5 to 10 percent of the unit
Terril soils: 5 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

835D2—Storden-Omsrud complex, 9 to 14 percent slopes, moderately eroded

Component Description

Storden, moderately eroded, and similar soils

Extent: 44 to 52 percent of the unit
Geomorphic setting: Ground moraines
Slope range: 9 to 14 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Calcareous till
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 11 inches
Content of organic matter in the upper 10 inches: 1.5 percent

Omsrud, moderately eroded, and similar soils

Extent: 29 to 40 percent of the unit
Geomorphic setting: Ground moraines
Slope range: 9 to 14 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Calcareous till
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 11.5 inches
Content of organic matter in the upper 10 inches: 2.2 percent

Additional Components

Sunburg soils: 0 to 15 percent of the unit
Terril soils: 3 to 7 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

835E2—Storden-Omsrud complex, 14 to 18 percent slopes, moderately eroded

Component Description

Storden, moderately eroded, and similar soils

Extent: 40 to 60 percent of the unit
Geomorphic setting: Ground moraines
Slope range: 14 to 18 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Calcareous till
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 10.9 inches
Content of organic matter in the upper 10 inches: 1.6 percent

Omsrud, moderately eroded, and similar soils

Extent: 30 to 50 percent of the unit
Geomorphic setting: Ground moraines
Slope range: 14 to 18 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Calcareous till
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 11.5 inches
Content of organic matter in the upper 10 inches: 2.2 percent

Additional Components

Storden soils that are only slightly eroded: 0 to 7 percent of the unit
Terril soils: 0 to 5 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

854D—Histosols, fens, 2 to 25 percent slopes

Component Description

Histosols and similar soils

Extent: 70 to 95 percent of the unit
Geomorphic setting: Hillslopes on uplands
Position on the landform: Backslopes
Slope range: 2 to 25 percent
Texture of the surface layer: Various textures
Depth to restrictive feature: More than 60 inches
Drainage class: Poorly drained
Parent material: Organic material over till
Flooding: None
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface

Additional Components

Coland soils: 0 to 10 percent of the unit
Klossner soils: 0 to 20 percent of the unit
Storden, moderately eroded: 0 to 10 percent of the unit
Terril soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Wildlife habitat

874—Dickinson sandy loam, lacustrine substratum, 0 to 2 percent slopes

Component Description

Dickinson, lacustrine substratum, and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Flats in relict glacial lakes
Slope range: 0 to 2 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Eolian sediments overlying lacustrine sediments
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 5.4 inches
Content of organic matter in the upper 10 inches: 2.5 percent

Additional Components

Ocheyedan, lacustrine substratum: 5 to 12 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

874B—Dickinson sandy loam, lacustrine substratum, 2 to 5 percent slopes

Component Description

Dickinson, lacustrine substratum, and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Rises in relict glacial lakes
Slope range: 2 to 5 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Eolian sediments overlying lacustrine sediments
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 5.4 inches
Content of organic matter in the upper 10 inches: 2.5 percent

Additional Components

Ocheyedan, lacustrine substratum: 5 to 12 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

874C2—Dickinson sandy loam, lacustrine substratum, 5 to 9 percent slopes, moderately eroded

Component Description

Dickinson, lacustrine substratum, moderately eroded, and similar soils

Extent: 70 to 90 percent of the unit
Geomorphic setting: Rises in relict glacial lakes
Slope range: 5 to 9 percent
Texture of the surface layer: Sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Eolian sediments overlying lacustrine sediments
Flooding: None
Depth to seasonal high water table (in undrained areas): More than 6 feet
Available water capacity to a depth of 60 inches: 5.4 inches
Content of organic matter in the upper 10 inches: 1.3 percent

Additional Components

Ocheyedan, lacustrine substratum, moderately eroded: 5 to 12 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

875—Roine fine sandy loam, 0 to 2 percent slopes

Component Description

Roine and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Flats on uplands
Slope range: 0 to 2 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Eolian sediments overlying till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 9.1 inches
Content of organic matter in the upper 10 inches: 2.3 percent

Additional Components

Dickinson soils: 5 to 10 percent of the unit
Ocheyedan soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

875B—Roine fine sandy loam, 2 to 5 percent slopes

Component Description

Roine and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Ridges on uplands
Slope range: 2 to 5 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Eolian sediments overlying till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 9.1 inches
Content of organic matter in the upper 10 inches: 2.3 percent

Additional Components

Ocheyedan soils: 5 to 12 percent of the unit
Dickinson soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

875C2—Roine fine sandy loam, 5 to 9 percent slopes, moderately eroded

Component Description

Roine, moderately eroded, and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Hillslopes on uplands
Slope range: 5 to 9 percent
Texture of the surface layer: Fine sandy loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Eolian sediments overlying till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 9.2 inches
Content of organic matter in the upper 10 inches: 2.3 percent

Additional Components

Dickinson soils: 5 to 15 percent of the unit
Ocheyedan soils: 0 to 7 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

878—Ocheyedan loam, 0 to 2 percent slopes

Component Description

Ocheyedan and similar soils

Extent: 75 to 90 percent of the unit
Geomorphic setting: Flats on uplands
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.5 inches
Content of organic matter in the upper 10 inches: 3.2 percent

Additional Components

Everly soils: 5 to 10 percent of the unit
Fostoria soils: 5 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

878B—Ocheyedan loam, 2 to 5 percent slopes

Component Description

Ocheyedan and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Ridges on uplands
Slope range: 2 to 5 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loamy sediments over till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.5 inches
Content of organic matter in the upper 10 inches: 3.2 percent

Additional Components

Everly soils: 5 to 10 percent of the unit
Fostoria soils: 0 to 10 percent of the unit
Ocheyedan, moderately eroded: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

879—Fostoria loam, 1 to 3 percent slopes

Component Description

Fostoria and similar soils

Extent: 75 to 90 percent of the unit
Geomorphic setting: Ridges on uplands
Slope range: 1 to 3 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained
Parent material: Loamy sediments over till
Flooding: None
Depth to seasonal high water table (in undrained areas): 1.0 to 3.5 feet
Available water capacity to a depth of 60 inches: 12.6 inches
Content of organic matter in the upper 10 inches: 5.2 percent

Additional Components

Everly soils: 5 to 10 percent of the unit
Ocheyedan soils: 5 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

928—Annieville silty clay loam, 0 to 2 percent slopes

Component Description

Annieville and similar soils

Extent: 70 to 90 percent of the unit
Geomorphic setting: Flats on uplands
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Parent material: Loess over till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.9 inches
Content of organic matter in the upper 10 inches: 3.9 percent

Additional Components

Galva soils: 5 to 15 percent of the unit
McCreath soils: 0 to 10 percent of the unit
Sac soils: 0 to 15 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

928B—Annieville silty clay loam, 2 to 5 percent slopes

Component Description

Annieville and similar soils

Extent: 70 to 95 percent of the unit
Geomorphic setting: Hillslopes on uplands; ridges on uplands
Slope range: 2 to 5 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: More than 60 inches
Drainage class: Moderately well drained
Parent material: Loess over till
Flooding: None
Depth to seasonal high water table (in undrained areas): 4 to 6 feet
Available water capacity to a depth of 60 inches: 11.9 inches
Content of organic matter in the upper 10 inches: 3.5 percent

Additional Components

Galva soils: 5 to 10 percent of the unit
Sac soils: 5 to 15 percent of the unit
McCreath soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

992—Gillett Grove silty clay loam, depressional, 0 to 1 percent slopes

Component Description

Gillett Grove and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Depressions on uplands
Slope range: 0 to 1 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: More than 60 inches
Drainage class: Poorly drained
Parent material: Loess overlying till
Flooding: None
Seasonal high water table (in undrained areas): 1 foot above to 1 foot below the surface
Available water capacity to a depth of 60 inches: 12.1 inches

Content of organic matter in the upper 10 inches: 6.2 percent

Additional Components

Gillett Grove soils that are not in depressions: 10 to 20 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

1053—Belmann clay loam, gypsum phase, 0 to 2 percent slopes

Component Description

Belmann, gypsum phase, and similar soils

Extent: 65 to 90 percent of the unit
Geomorphic setting: Flats in relict glacial lakes; swales in relict glacial lakes
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy sediments overlying lacustrine sediments
Flooding: None
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 10.7 inches
Content of organic matter in the upper 10 inches: 4.4 percent

Additional Components

Belmann soils that do not have gypsum: 5 to 10 percent of the unit
Okoboji soils: 5 to 10 percent of the unit
Fostoria, lacustrine substratum: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Tall grass prairie; prairie
Major uses: Cropland, hayland, and pasture

1091—McCreath silty clay loam, 0 to 2 percent slopes

Component Description

McCreath and similar soils

Extent: 70 to 95 percent of the unit
Geomorphic setting: Flats on uplands
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loess over till
Flooding: None
Depth to seasonal high water table (in undrained areas): 1.0 to 3.5 feet
Available water capacity to a depth of 60 inches: 11.7 inches
Content of organic matter in the upper 10 inches: 5.1 percent

Additional Components

Ransom soils: 5 to 15 percent of the unit
Gillett Grove soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

1092—Gillett Grove silty clay loam, 0 to 2 percent slopes

Component Description

Gillett Grove and similar soils

Extent: 75 to 95 percent of the unit
Geomorphic setting: Flats on uplands
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loess overlying till
Flooding: None
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 12.1 inches
Content of organic matter in the upper 10 inches: 6.2 percent

Additional Components

McCreath soils: 5 to 15 percent of the unit
Afton soils: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

1133—Colo silty clay loam, channeled, 0 to 2 percent slopes, frequently flooded

Component Description

Colo and similar soils

Extent: 65 to 85 percent of the unit
Geomorphic setting: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: More than 60 inches
Drainage class: Poorly drained
Parent material: Silty alluvium
Frequency of flooding: Frequent
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 12.4 inches
Content of organic matter in the upper 10 inches: 5.8 percent

Additional Components

Colo soils that are not channeled: 0 to 20 percent of the unit
Coland soils: 0 to 10 percent of the unit
Water: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Wildlife habitat, pasture

1259—Biscay clay loam, 32 to 40 inches to sand and gravel, depressional, 0 to 1 percent slopes

Component Description

Biscay, depressional, and similar soils

Extent: 70 to 95 percent of the unit
Geomorphic setting: Depressions on stream terraces
Slope range: 0 to 1 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Parent material: Loamy sediments over sand and gravel
Flooding: None
Seasonal high water table (in undrained areas): 1 foot above to 1 foot below the surface
Available water capacity to a depth of 60 inches: 8.5 inches
Content of organic matter in the upper 10 inches: 6.9 percent

Additional Components

Shandep soils: 5 to 15 percent of the unit
Talcot soils: 5 to 10 percent of the unit
Biscay soils that are 24 to 32 inches to sand and gravel: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

1385—Ocheda silty clay loam, 1 to 3 percent slopes

Component Description

Ocheda and similar soils

Extent: 85 percent of the unit
Geomorphic setting: Rises on ground moraines
Slope range: 1 to 3 percent
Texture of the surface layer: Silty clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Lacustrine sediments over till
Flooding: None
Depth to seasonal high water table (in undrained areas): 1.0 to 3.5 feet
Available water capacity to a depth of 60 inches: 8.5 inches
Content of organic matter in the upper 10 inches: 5 percent

Additional Components

Collinwood soils: 0 to 10 percent of the unit
Guckeen soils: 0 to 10 percent of the unit
Nicollet soils: 0 to 10 percent of the unit
Clarion soils: 0 to 5 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

1508—Belmann clay loam, 0 to 2 percent slopes

Component Description

Belmann and similar soils

Extent: 70 to 95 percent of the unit
Geomorphic setting: Flats in relict glacial lakes
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam

Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy sediments overlying lacustrine sediments
Flooding: None
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 9.7 inches
Content of organic matter in the upper 10 inches: 5 percent

Additional Components

Ocheyedan, lacustrine substratum: 5 to 15 percent of the unit
Belmann, gypsum phase: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Cropland, hayland, and pasture

1585—Spillville-Coland complex, channeled, 0 to 2 percent slopes, frequently flooded

Component Description

Spillville and similar soils

Extent: 35 to 50 percent of the unit
Geomorphic setting: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Parent material: Loamy alluvium
Frequency of flooding: Frequent
Depth to seasonal high water table (in undrained areas): 1.0 to 3.5 feet
Available water capacity to a depth of 60 inches: 11.6 inches
Content of organic matter in the upper 10 inches: 4 percent

Coland and similar soils

Extent: 30 to 40 percent of the unit
Geomorphic setting: Flood plains
Slope range: 0 to 2 percent
Texture of the surface layer: Clay loam
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Poorly drained
Parent material: Loamy alluvium
Frequency of flooding: Frequent
Seasonal high water table (in undrained areas): At the surface to 1 foot below the surface
Available water capacity to a depth of 60 inches: 11.3 inches
Content of organic matter in the upper 10 inches: 6 percent

Additional Components

Hanlon soils: 5 to 15 percent of the unit
Havelock soils: 0 to 10 percent of the unit
Water: 0 to 10 percent of the unit

Management Considerations

Native plant cover: Prairie
Major uses: Pasture, wildlife habitat

4000—Urban land

• This map unit consists of areas that are covered by buildings, roads, streets, parking lots, mobile home parks, and other structures. The original soils can no longer be identified.

5010—Pits, sand and gravel

Component Description

Pits, sand and gravel

Definition: This map unit consists of areas from which sand and gravel have been removed.
Extent: 100 percent of the unit
Geomorphic setting: Stream terraces
Slope range: 0 to 4 percent
Depth to restrictive feature: Very deep (more than 60 inches)
Drainage class: Well drained
Parent material: Loamy alluvium over sand and gravel

Management Considerations

Native plant cover: Prairie
Major uses: Source of sand and gravel; wildlife habitat

5040—Udorthents, loamy (cut and fill land)

Component Description

Udorthents, loamy

Extent: 100 percent of the unit
Slope range: 0 to 8 percent
Depth to restrictive feature: Very deep (more than 60 inches)

Depth to seasonal high water table (in undrained areas): More than 6 feet
Drainage class: Well drained

Management Considerations

Native plant cover: Prairie
Major uses: Fill material, wildlife habitat

5060—Pits, clay

Component Description

Pits, clay

Definition: This map unit consists of areas from which clay has been removed for use as drainage tile.
Extent: 100 percent of the unit
Depth to restrictive feature: Very deep (more than 60 inches)

Management Considerations

Major uses: Wildlife habitat

AW—Animal waste

- This map unit consists of shallow ponds constructed to hold animal waste from farm feedlots.

SL—Sewage lagoon

- This map unit consists of shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid waste.

W—Water

- This map unit consists of natural bodies of water.

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 as 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 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, gravel, 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.

Interpretive Ratings

The interpretive tables in this survey rate the soils in the survey area for various uses. Many of the tables identify the limitations that affect specified uses and indicate the severity of those limitations. The ratings in these tables are both verbal and numerical.

Rating Class Terms

Rating classes are expressed in the tables in terms that indicate the extent to which the soils are limited by all of the soil features that affect a specified use or in terms that indicate the suitability of the soils for the use. Thus, the tables may show limitation classes or suitability classes. Terms for the limitation classes are *not limited, somewhat limited,* and *very limited*. The suitability ratings are expressed as *well suited, moderately suited, poorly suited,* and *unsuited* or as *good, fair,* and *poor*.

Numerical Ratings

Numerical ratings in the tables indicate the relative severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use and the point at which the soil feature is not a limitation. The limitations appear in order from the most limiting to the least limiting. Thus, if more than one limitation is identified, the most severe limitation is listed first and the least severe one is listed last.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed, the system of land capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is described.

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.

Cropland Management Considerations

The management concerns affecting the use of the detailed soil map units for crops are shown in table 5. The main concerns in managing nonirrigated cropland are conserving moisture, controlling wind erosion and water erosion, and maintaining soil fertility.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the water infiltration rate. Applying conservation tillage and conservation cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

Generally, a combination of several practices is needed to control *wind erosion* and *water erosion.* Conservation tillage, stripcropping, field windbreaks, contour farming, conservation cropping systems, crop residue management, terraces, diversions, and grassed waterways (fig. 7) help to prevent excessive soil loss.

Measures that are effective in *maintaining soil fertility* include applying fertilizer, both organic and inorganic, including manure; incorporating crop residue or green manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients and thus helps to maintain productivity, although the level of fertility can be reduced even in areas where erosion is controlled. All soils used for nonirrigated crops respond well to applications of fertilizer.

Some of the considerations shown in the table cannot be easily overcome. These are *channels, flooding, gullies,* and *ponding.*

Additional considerations include the following:

Lime content, limited available water capacity, potential poor tilth and compaction, and *restricted permeability.*—These limitations can be minimized by incorporating green manure crops, manure, or crop residue into the soil; applying a system of conservation tillage; and using conservation cropping systems. Also, crops may respond well to additions of phosphate fertilizer in areas of soils that have a high content of lime.

Potential for ground-water contamination.—The proper use of nutrients and pesticides can reduce the risk of ground-water contamination.

Potential for surface-water contamination.—The risk of surface-water contamination can be reduced by the proper use of nutrients and pesticides and by conservation farming practices that reduce the runoff rate.

Surface crusting.—This limitation retards seedling development after periods of heavy rainfall.

Surface rock fragments.—This limitation causes rapid wear of tillage equipment. It cannot be easily overcome.

Surface stones.—Stones or boulders on or near the surface can hinder normal tillage unless they are removed.

Salt content.—In areas where this is a limitation, only salt-tolerant crops should be grown.

On irrigated soils the main management concerns are efficient water use, nutrient management, control of erosion, pest and weed control, and timely planting and harvesting for a successful crop. An irrigation system that provides optimum control and distribution of water at minimum cost is needed. Overirrigation wastes water, leaches plant nutrients, and causes erosion. Also, it can increase wetness and soil salinity.

Explanation of Criteria

Acid soil.—The pH is less than 6.1.

Channeled.—The word “channeled” is included in the map unit name.

Dense layer.—The bulk density is 1.80 g/cc or greater within the soil profile.

Depth to rock.—The depth to bedrock is less than 40 inches.

Eroded.—The word “eroded” is included in the map unit name.

Excessive permeability.—Saturated hydraulic conductivity is 42 micrometers per second or more within the soil profile.

Flooding.—Flooding is occasional, frequent, or very frequent.

Gullied.—The word “gullied” is included in the map unit name.

High content of organic matter.—The surface layer has more than 20 percent organic matter.

Lime content.—The pH is 7.4 or more in the surface layer, or the wind erodibility group is 4L.

Limited available water capacity.—The available water capacity calculated to a depth of 60 inches or to a root-limiting layer is 6 inches or less.

Limited content of organic matter.—The content of organic matter is 2 percent or less in the surface layer.

Ponding.—Ponding duration is assigned to the map unit component. Water is above the surface.

Potential poor tilth and compaction.—The content of clay is 27 percent or more in the surface layer.

Potential for ground-water contamination (by nutrients or pesticides).—The depth to a seasonal high water table is 4 feet or less, the saturated hydraulic conductivity of any layer is more than 42 micrometers per second, or the depth to bedrock is less than 60 inches.

Figure 7.—Grassed waterways, contour farming, and other conservation practices help to control erosion in many areas of Clay County, particularly in areas of MLRA 107.

Potential for surface-water contamination (by nutrients or pesticides).—The map unit component is occasionally, frequently, or very frequently flooded, is subject to ponding, is assigned to hydrologic group C or D and has a slope of more than 2 percent, is assigned to hydrologic group A and has a slope of more than 6 percent, or is assigned to hydrologic group B, has a slope of 3 percent or more, and has a K factor of more than 0.17.

Restricted permeability.—Saturated hydraulic conductivity is less than 0.42 micrometer per second within the soil profile.

Salt content.—The electrical conductivity is 4 or more in the surface layer or 8 or more within a depth of 30 inches.

Seasonal high water table.—The water table is within 2.5 feet of the surface.

Slope (equipment limitation).—The slope is more than 15 percent.

Surface crusting.—The content of clay in the surface layer is 27 percent or more, and the content of organic matter is 2 percent or less.

Surface rock fragments (equipment limitation).—The terms describing the texture of the surface layer include any rock fragment modifier, except for gravelly, channery, stony, very stony, extremely stony, bouldery, very bouldery, and extremely bouldery.

Surface stones (equipment limitation).—The word “stony” or “bouldery” is included in the description of the surface layer, or at least 0.01 percent of the surface is covered with boulders.

Water erosion.—Either the slope is 6 percent or more, or the slope is more than 3 percent and less than 6 percent and the surface layer is not sandy.

Wind erosion.—The wind erodibility group is 1, 2, 3, or 4L.

Hydrologic groups are described under the heading “Water Features.” Erosion factors (e.g., K factor) and wind erodibility groups are described under the heading “Physical Properties.”

Crop Yield Estimates

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

Table 6 also shows the corn suitability rating (CSR) for the soils in the survey area. Corn suitability ratings provide a relative ranking of all soils mapped in the State of Iowa based on their potential to be utilized for the intensive production of row crops. The CSR is an index that can be used to rate the potential production of one soil compared with another over a period of time. The CSR considers average weather conditions and frequency of use of the soil for row crops. Ratings range from 100 for soils that have no physical limitations, are on minimal slopes, and can be continuously row cropped to as low as 5 for soils that have severe limitations affecting the production of row crops. The ratings listed in this table assume adequate management, natural weather conditions (no irrigation), artificial drainage where required, and no land leveling or terracing. They also assume that soils in the lower positions on the landscape are not affected by frequent damaging floods. The weighted CSR for a given field can be modified by the occurrence of sandy spots, local deposits, rock and gravel outcrops, field boundaries, and noncrossable drainageways. Even though predicted average yields will change with time, the CSRs are expected to remain relatively constant in relation to one another.

The CSRs in Clay County range from 83 (for map unit 1091) to 5 (for map unit 41C, for example). No ratings are provided for miscellaneous areas because of the variability of properties and use of these areas.

Inherent subsoil fertility levels, in terms of potential plant-available phosphorus and potassium, also are given in table 6. Soil tests of the tilled layer are used to determine the most profitable rates of fertilizers for various crops. Nutrient levels in the subsurface layers influence crop yields, particularly in the drier seasons when the nutrients in the dry tilled layer become temporarily unavailable to plants. The availability of nutrients in the tilled layer and the subsoil influences the relative uptake from the two zones in the soil profile. Fertilizer recommendations based on soil tests of the tilled layer may be adjusted by the average nutrient levels in the subsoil of each soil series. Fertilizer recommendations are adjusted for subsoil nutrient levels. The ratings given in the table are described as follows:

Subsoil phosphorus.—The amount of plant-available phosphorus in the subsoil expressed in parts per million and based on the weighted average of air-dried soil samples from the subsoil (at a depth of 30 to 42 inches). (The value listed for complexes is the most limiting value of the soils identified in the map unit name.) A rating of very low indicates less than 7.5 ppm; low, 7.5 to 13.0 ppm; medium, 13.0 to 22.5 ppm; and high, more than 22.5 ppm.

Subsoil potassium.—The amount of plant-available potassium in the subsoil expressed in parts per million and based on the weighted average of air-dried soil samples from the subsoil (at a depth of 12 to 24 inches). (The value listed for complexes is the most limiting value of the soils identified in the map unit name.) A rating of very low indicates less than 50 ppm; low, 50 to 79 ppm; medium, 79 to 125 ppm; and high, more than 125 ppm.

Pasture and Hayland Interpretations

Under good management, proper grazing is essential for the production of high-quality forage, stand survival, and erosion control. Proper grazing helps plants to maintain sufficient and generally vigorous top growth during the growing season. Brush control is essential in many areas, and weed control generally is needed. Rotation grazing and renovation also are important management practices.

The average yields per acre that can be expected of the principal pasture and hay crops under a high level of management are shown in table 7. Yield estimates are often provided in animal unit months (AUM), or 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.

The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about forage yields other than those shown in the table.

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 take into account 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 generally are grouped at three levels—capability class, subclass, and unit (USDA, 1961). These categories indicate the degree and kinds of limitations affecting mechanized farming systems that produce the more commonly grown field crops, such as corn, small grain, cotton, hay, and field-grown vegetables. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use.

If properly managed, soils in classes 1, 2, 3, and 4 are suitable for the mechanized production of commonly grown field crops and for pasture and woodland. The degree of the soil limitations affecting the production of cultivated crops increases progressively from class 1 to class 4. The limitations can affect levels of production and the risk of permanent soil deterioration caused by erosion and other factors.

Soils in classes 5, 6, and 7 are generally not suited to the mechanized production of commonly grown field crops without special management, but they are suitable for plants that provide a permanent cover, such as grasses and trees. The severity of the soil limitations affecting crops increases progressively from class 5 to class 7.

Areas in class 8 are generally not suitable for crops, pasture, or woodland without a level of management that is impractical. These areas may have potential for other uses, such as recreational facilities and wildlife habitat.

Capability subclasses identify the dominant kind of limitation in the class. They are designated by adding a small letter, *e, w, s,* or *c*, to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless a 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 has been 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.

There are no subclasses in class 1 because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use mainly to pasture, woodland, wildlife habitat, or recreation.

The capability classification of the soils in the survey area is given in tables 6 and 7.

Prime Farmland

Prime farmland is of major importance in meeting the Nation’s short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, State, and Federal levels, as well as individuals, must encourage and facilitate the wise use of our Nation’s prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, feed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. An adequate moisture supply and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland or for other purposes. They either are used for food and fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water-control structures. Public land is land not available for farming in National forests, National parks, military reservations, and State parks.

Prime farmland soils commonly receive an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable, and the level of acidity or alkalinity and the content of salts and sodium are acceptable. The soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods, and they are not frequently flooded during the growing season or are protected from flooding. Slopes range mainly from 0 to 6 percent.

Soils that have a high water table or are subject to flooding may qualify as prime farmland where these limitations are overcome by drainage measures or flood control. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information about the criteria for prime farmland can be obtained at the local office of the Natural Resources Conservation Service.

A recent trend in land use has been the conversion of prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on lands that are less productive than prime farmland.

About 310,870 acres, or nearly 85 percent of the survey area, meets the requirements for prime farmland.

The map units in the survey area that meet the requirements for prime farmland are listed in table 8. This list does not constitute a recommendation for a particular land use. On some soils included in the table, measures that overcome limitations are needed. The need for these measures is indicated in parentheses after the map unit name. The location of each map unit is shown on the detailed soil maps. The soil qualities that affect use and management are described in the section “Detailed Soil Map Units.”

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, yards, fruit trees, gardens, and cropland from wind and snow; help to keep snow on fields; and provide food and cover for wildlife. 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.

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 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local office of the Natural Resources Conservation Service or of the Cooperative Extension Service or from a commercial nursery.

Woodland Management and Productivity

Table 10 can help woodland owners or forest managers plan the use of soils for wood crops. Only those soils suitable for wood crops are listed.

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

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

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

Recreation

The soils of the survey area are rated in tables 11a and 11b according to limitations that affect their suitability for recreation. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The ratings in the tables are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are 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.

The information in tables 11a and 11b can be supplemented by other information in this survey, for example, interpretations for building site development, construction materials, sanitary facilities, and water management.

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 ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas. The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Playgrounds require soils that are nearly level, are free of stones, and can withstand intensive foot traffic. The ratings are based on the soil properties that affect the ease of developing playgrounds and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of playgrounds. For good trafficability, the surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Paths and trails for hiking and horseback riding should require little or no slope modification through cutting and filling. The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

Off-road motorcycle trails require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, slope, depth to a water table, ponding, flooding, and texture of the surface layer.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer. The suitability of the soil for traps, tees, roughs, and greens is not considered in the ratings.

Wildlife Habitat

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

In table 12, 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 also are considerations. Examples of grain and seed crops are corn, soybeans, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture also are considerations. Examples of grasses and legumes are bromegrass, timothy, orchardgrass, 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 also are considerations. Examples of wild herbaceous plants are bluestem, bluegrass, dandelions, goldenrod, ragweed, wheatgrass, and nightshade.

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, box elder, birch, maple, green ash, willow, and American elm.

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, 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 Hungarian partridge, ring-necked pheasant, bobwhite quail, sharp-tailed grouse, meadowlark, field sparrow, killdeer, cottontail rabbit, and red fox.

Habitat for woodland wildlife consists of areas of deciduous and/or coniferous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, owls, tree 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 data in the tables described under the heading “Soil Properties.”

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 between the surface and a depth of 5 to 7 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 particle-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 7 feet of the surface, soil wetness, depth to a water table, ponding, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

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

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

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

Building Site Development

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. Tables 13a and 13b show the degree and kind of soil limitations that affect dwellings with and without basements, small commercial buildings, local roads and streets, shallow excavations, and lawns and landscaping.

The ratings in the tables are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

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 soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Sanitary Facilities

Tables 14a and 14b show the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, sanitary landfills, and daily cover for landfill. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

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 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

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. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Soil permeability is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a permeability rate of more than 2 inches per hour are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, 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. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

A *trench sanitary landfill* is an area where solid waste is placed in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil excavated at the site. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. The ratings in the table are based on the soil properties that affect the risk of pollution, the ease of excavation, trafficability, and revegetation. These properties include permeability, depth to bedrock or a cemented pan, depth to a water table, ponding, slope, flooding, texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, onsite investigation may be needed.

Hard, nonrippable bedrock, creviced bedrock, or highly permeable strata in or directly below the proposed trench bottom can affect the ease of excavation and the hazard of ground-water pollution. Slope affects construction of the trenches and the movement of surface water around the landfill. It also affects the construction and performance of roads in areas of the landfill.

Soil texture and consistence affect the ease with which the trench is dug and the ease with which the soil can be used as daily or final cover. They determine the workability of the soil when dry and when wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and are difficult to place as a uniformly thick cover over a layer of refuse.

The soil material used as the final cover for a trench landfill should be suitable for plants. It should not have excess sodium or salts and should not be too acid. The surface layer generally has the best workability, the highest content of organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

In an *area sanitary landfill*, solid 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. A final cover of soil material at least 2 feet thick is placed over the completed landfill. The ratings in the table are based on the soil properties that affect trafficability and the risk of pollution. These properties include flooding, permeability, depth to a water table, ponding, slope, and depth to bedrock or a cemented pan.

Flooding is a serious problem because it can result in pollution in areas downstream from the landfill. If permeability is too rapid or if fractured bedrock, a fractured cemented pan, or the water table is close to the surface, the leachate can contaminate the water supply. Slope is a consideration because of the extra grading required to maintain roads in the steeper areas of the landfill. Also, leachate may flow along the surface of the soils in the steeper areas and cause difficult seepage problems.

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. The ratings in the table also apply to the final cover for a landfill. They are based on the soil properties that affect workability, the ease of digging, and the ease of moving and spreading the material over the refuse daily during wet and dry periods. These properties include soil texture, depth to a water table, ponding, rock fragments, slope, depth to bedrock or a cemented pan, reaction, and content of salts, sodium, or lime.

Loamy or silty soils that are free of large stones and excess gravel are the best cover for a landfill. Clayey soils may be sticky and difficult to spread; sandy soils are subject to wind erosion.

Slope affects the ease of excavation and of moving the cover material. Also, it can influence runoff, erosion, and reclamation of the borrow area.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. It should not have excess sodium, salts, or lime and should not be too acid.

Construction Materials

Table 15 gives information about the soils as potential sources of gravel, sand, and topsoil. Normal compaction, minor processing, and other standard construction practices are assumed.

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 15, only the likelihood 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 Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains sand or gravel, the soil is considered a likely source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness.

The soils are rated as *possible, probable,* or *improbable* sources of gravel and are rated *good, fair,* or *poor* as potential sources of sand. In this table, gravel is defined as particles ranging from 0.2 inch to 3.0 inches in diameter. Soils rated as a *possible* source of gravel contain at least 25 percent gravel, by weight. Soils rated as a *probable* source contain at least 50 percent gravel, by weight. For sand, a rating of *good* or *fair* means that the source material is likely to be in or below the soil. For both sand and gravel, the bottom layer and the thickest layer of the soils are assigned numerical ratings. These ratings indicate the likelihood that the layer is a source of sand or gravel. The number 0.00 indicates that the layer is a poor source. The number 1.00 indicates that the layer is a good source. A number between 0.00 and 1.00 indicates the degree to which the layer is a likely source.

The soils are rated *good, fair,* or *poor* as potential sources of topsoil. The features that limit the soils as sources of this material are specified in the table. The numerical ratings given after the specified features indicate the degree to which the features limit the soils as sources of topsoil. The lower the number, the greater the limitation.

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. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

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 16 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 ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

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. Embankments that have zoned construction (core and shell) are not considered. 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.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey.

Soil properties are ascertained 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 particle-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 are shown in tables. They include engineering index properties, physical and chemical properties, and pertinent soil and water features.

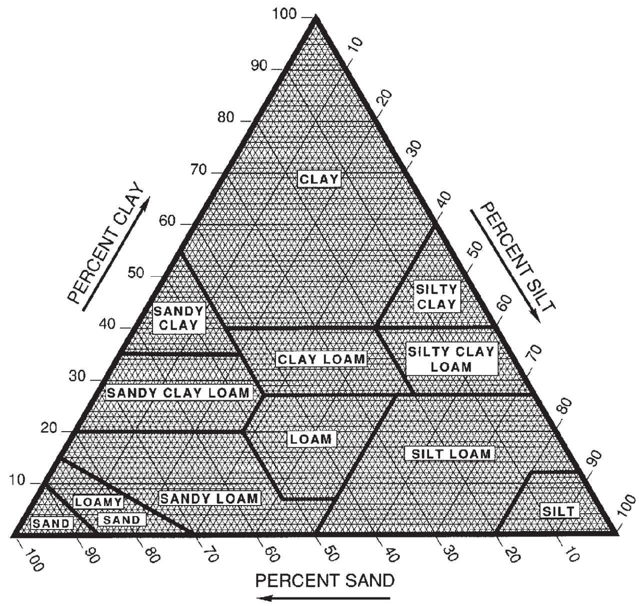


Figure 8.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 17 gives the engineering classifications and the range of index properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 8). “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 15 percent or more, an appropriate modifier is added, for example, “gravelly.” Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2001) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2000).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-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 particle-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 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of particle-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 generally omitted in the table.

Physical Properties

Table 18 shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In table 18, the estimated clay content of each 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 affect the fertility and physical condition of the soil and 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 $^{1}/_{3}$- or $^{1}/_{10}$-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each 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. Depending on soil texture, a bulk density of more than 1.4 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 term “permeability,” as used in soil surveys, indicates saturated hydraulic conductivity (K_{sat}). The estimates in the table indicate the rate of water movement, in inches per hour, 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 soil layer. The capacity varies, depending on soil properties that affect retention of water. 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.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 18, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in table 18 as the K factor (Kw and Kf) and the T factor. 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) and the Revised Universal Soil Loss Equation (RUSLE) 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 and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

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 susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. Descriptions of these groups are available in the National Soil Survey Handbook (USDA, 2003).

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Chemical Properties

Table 19 shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of extractable bases 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. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil 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.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Water Features

Table 20 gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, 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 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 a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

The *months* in the table indicate the portion of the year in which the feature is most likely to be a concern.

Water table refers to a saturated zone in the soil. Table 20 indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. Table 20 indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area 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, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 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); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

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.

Soil Features

Table 21 gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for 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 to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes 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 or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999). 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 22 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve 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 Udoll (*Ud*, meaning humid, 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; type of saturation; 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 Hapludolls (*Hapl*, meaning minimal horizonation, plus *udoll*, the suborder of the Mollisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup 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 taxonomic class. 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 Hapludolls.

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, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, superactive, mesic Typic Hapludolls.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. 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” (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (Soil Survey Staff, 1999). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

Afton Series

Typical Pedon

Afton silty clay loam, 0 to 2 percent slopes, in a cultivated field; 500 feet north and 75 feet east of the southwest corner of sec. 24, T. 96 N., R. 38 W., Lone Tree Township; USGS Royal, Iowa, topographic quadrangle; lat. 43 degrees 06 minutes 50 seconds N. and long. 95 degrees 17 minutes 20 seconds W., NAD 27:

Ap—0 to 7 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; moderate fine granular structure; friable; slightly acid; abrupt wavy boundary.

A1—7 to 16 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; slightly acid; gradual smooth boundary.

A2—16 to 25 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; slightly acid; gradual smooth boundary.

A3—25 to 32 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; neutral; clear smooth boundary.

Bg1—32 to 37 inches; dark gray (5Y 4/1) silty clay loam; moderate fine subangular blocky structure; friable; common very dark gray (10YR 3/1) organic coatings on faces of peds; few fine distinct yellowish brown (10YR 5/6) redoximorphic concentrations; neutral; clear smooth boundary.

Bg2—37 to 43 inches; dark gray (5Y 4/1) silty clay loam; moderate fine subangular blocky structure; friable; many fine dark manganese concretions; common fine distinct strong brown (7.5YR 5/6) redoximorphic concentrations; neutral; abrupt wavy boundary.

2Cg1—43 to 54 inches; gray (5Y 5/1) clay loam; massive; friable; many fine dark manganese concretions; common or many medium distinct strong brown (7.5YR 5/6), few fine distinct strong brown (7.5YR 5/8), and few fine and medium prominent yellowish red (5YR 4/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; abrupt wavy boundary.

2Cg2—54 to 65 inches; gray (5Y 5/1) loam that has thin strata of sandy loam and silty clay loam; massive; friable; thin strata (2 inches thick) of strong brown (7.5YR 5/8) medium and coarse sand at a depth of 63 to 65 inches; few medium distinct strong brown (7.5YR 5/6) redoximorphic concentrations; slightly effervescent; moderately alkaline; abrupt wavy boundary.

3Cg3—65 to 72 inches; olive gray (5Y 5/2) loam; massive; friable; few fine dark manganese concretions; about 3 percent gravel; about 2 percent fine fragments of shale; few medium prominent strong brown (7.5YR 5/8) redoximorphic concentrations; slightly effervescent; moderately alkaline; abrupt wavy boundary.

3Cg4—72 to 80 inches; olive gray (5Y 5/2) loam; massive; firm; about 3 percent gravel; about 2 percent fine fragments of shale; many fine and medium prominent strong brown (7.5YR 5/8) redoximorphic concentrations; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 36 to 55 inches
Depth to till: More than 40 inches
Thickness of the mollic epipedon: 24 to 32 inches

A horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam
Reaction—slightly acid to slightly alkaline

Bg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay loam or silt loam
Reaction—neutral to moderately alkaline

2Cg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—loam or clay loam; stratified sediments overlie the till in some pedons
Reaction—slightly alkaline or moderately alkaline

3Cg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—2
Texture—loam or clay loam
Reaction—slightly alkaline or moderately alkaline

Annieville Series

Typical Pedon

Annieville silty clay loam, 0 to 2 percent slopes, in a cultivated field; 135 feet south and 1,290 feet east of the northwest corner of sec. 35, T. 94 N., R. 38 W., Peterson Township; USGS Peterson, Iowa, topographic quadrangle; lat. 42 degrees 55 minutes 28 seconds N. and long. 95 degrees 18 minutes 17 seconds W., NAD 27:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; slightly acid; abrupt wavy boundary.

A—8 to 15 inches; very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; slightly acid; clear smooth boundary.

AB—15 to 20 inches; dark brown (10YR 3/3) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; gradual smooth boundary.

Bw1—20 to 31 inches; brown (10YR 4/3) silty clay loam; weak medium and fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

Bw2—31 to 38 inches; brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bw3—38 to 52 inches; olive brown (2.5Y 4/3) silt loam; weak fine subangular blocky structure; friable; many very fine dark manganese concentrations; few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; common fine faint grayish brown (2.5Y 5/2) redoximorphic depletions; slightly acid; abrupt wavy boundary.

2C1—52 to 57 inches; yellowish brown (10YR 5/4) sandy loam; single grain; loose; stone line with small pebbles at a depth of 52 to 54 inches; about 5 percent gravel; slightly effervescent; slightly alkaline; abrupt wavy boundary.

2C2—57 to 69 inches; mottled yellowish brown (10YR 5/4) and grayish brown (2.5Y 5/2) clay loam; massive; firm; about 3 percent gravel; many fine dark manganese concentrations; common medium prominent strong brown (7.5YR 5/8) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual smooth boundary.

2C3—69 to 80 inches; yellowish brown (10YR 5/6) clay loam; massive; firm; many fine dark manganese concentrations; grayish brown (2.5Y 5/2) linings of root channels; about 3 percent gravel; common medium prominent strong brown (7.5YR 5/8) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 40 to 60 inches
Thickness of the mollic epipedon: 10 to 20 inches
Depth to till: 40 to 60 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam
Reaction—slightly acid or neutral

AB horizon:
Hue—10YR
Value—2 to 4
Chroma—1 to 3
Texture—silt loam or silty clay loam
Reaction—slightly acid or neutral

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—silty clay loam or silt loam
Reaction—slightly acid or neutral

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—sandy loam, loam, or clay loam
Reaction—slightly alkaline or moderately alkaline

Belmann Series

Typical Pedon

Belmann clay loam, 0 to 2 percent slopes, in a cultivated field; 93 feet west and 700 feet south of the northeast corner of sec. 5, T. 96 N., R. 36 W., Sioux Township; USGS Dickens, Iowa, topographic quadrangle; 43 degrees 10 minutes 04 seconds N. and long. 95 degrees 06 minutes 45 seconds W., NAD 27:

Ap—0 to 8 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common very fine roots; slightly effervescent; slightly alkaline; abrupt smooth boundary.

A—8 to 16 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; weak medium granular structure; firm; common very fine roots; slightly effervescent; slightly alkaline; clear wavy boundary.

Bg1—16 to 24 inches; olive gray (5Y 4/2) clay loam; weak very fine subangular blocky structure; firm; common very fine roots; common distinct very dark gray (5Y 3/1) organic coatings on faces of peds; common fine prominent light olive brown (2.5Y 5/6) and common fine faint olive (5Y 5/3) redoximorphic concentrations; strongly effervescent; slightly alkaline; gradual smooth boundary.

2Bg2—24 to 32 inches; olive gray (5Y 5/2) silty clay; moderate very fine and fine subangular blocky structure; firm; common very fine roots; common distinct olive gray (5Y 4/2) organic coatings on faces of peds; common fine prominent irregular light olive brown (2.5Y 5/4 and 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; gradual smooth boundary.

2Bkg1—32 to 42 inches; olive gray (5Y 5/2) silty clay; moderate very fine and fine subangular blocky structure; firm; common very fine roots; few distinct dark gray (5Y 4/1) organic coatings on faces of peds; common fine irregular very pale brown (10YR 8/2) calcium carbonate nodules; common fine prominent yellowish brown (10YR 5/6) and light olive brown (2.5Y 5/6) irregular redoximorphic concentrations; strongly effervescent; slightly alkaline; gradual smooth boundary.

2Bkg2—42 to 52 inches; olive gray (5Y 5/2) silty clay; moderate very fine and fine subangular blocky structure; friable; few very fine roots; common fine irregular very pale brown (10YR 8/2) calcium carbonate nodules; many fine prominent yellowish brown (10YR 5/6) irregular redoximorphic concentrations; strongly effervescent; slightly alkaline; clear smooth boundary.

2BCg—52 to 61 inches; olive gray (5Y 5/2) silty clay loam; weak very fine prismatic structure parting to weak fine subangular blocky; friable; few very fine roots; many fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; clear smooth boundary.

2Cg—61 to 80 inches; olive gray (5Y 5/2) silty clay; massive; friable; common medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Depth to fine textured sediments: 20 to 40 inches
Thickness of the mollic epipedon: 10 to 24 inches

A or Ap horizon:
Hue—10YR, 2.5Y, or N
Value—2
Chroma—0 or 1
Texture—clay loam or loam
Reaction—slightly alkaline or moderately alkaline

Bg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—clay loam or silty clay loam
Reaction—slightly alkaline or moderately alkaline

2Bg or 2Bkg horizon:
Hue—5Y or 2.5Y
Value—4 or 5
Chroma—1 to 3
Texture—silty clay loam, silty clay, or clay
Reaction—slightly alkaline or moderately alkaline

2BCg or 2Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—2 or 3
Texture—silt loam, silty clay loam, silty clay, or clay
Reaction—slightly alkaline or moderately alkaline

Biscay Series

Typical Pedon

Biscay clay loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes, in a cultivated field; 680 feet east and 160 feet north of the southwest corner of sec. 2, T. 96 N., R. 38 W., Lone Tree Township; USGS Everly, Iowa, topographic quadrangle; lat. 43 degrees 09 minutes 23 seconds N. and long. 95 degrees 18 minutes 22 seconds W., NAD 27:

Ap—0 to 7 inches; black (N 2/0) clay loam, black (10YR 2/1) dry; moderate fine and medium subangular blocky structure parting to moderate fine granular; friable; neutral; abrupt smooth boundary.

A—7 to 17 inches; black (N 2/0) clay loam, black (10YR 2/1) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; slightly acid; gradual smooth boundary.

AB—17 to 23 inches; black (N 2/0) clay loam with some mixing of olive gray (5Y 4/2) clay loam, very dark gray (10YR 3/1) dry; moderate fine and medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bg1—23 to 27 inches; olive gray (5Y 5/2) and dark gray (5Y 4/1) clay loam; moderate fine and medium subangular blocky structure; friable; common black (5Y 2.5/1) organic coatings on faces of peds; neutral; clear smooth boundary.

Bg2—27 to 35 inches; olive gray (5Y 5/2) clay loam;

weak fine and medium subangular blocky structure; friable; few fine white (10YR 8/1) and very pale brown (10YR 8/3) calcium carbonate nodules; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; abrupt wavy boundary.

Bg3—35 to 39 inches; olive gray (5Y 5/2) sandy clay loam; very weak fine and medium subangular blocky structure; very friable; common white (10YR 8/1) calcium carbonate coatings on gravel; about 10 percent gravel; slightly effervescent; slightly alkaline; abrupt wavy boundary.

2Cg1—39 to 48 inches; grayish brown (2.5Y 5/2) loamy sand; single grain; loose; common white (10YR 8/1) calcium carbonate coatings on gravel; about 8 percent gravel; slightly effervescent; slightly alkaline; abrupt wavy boundary.

2Cg2—48 to 68 inches; grayish brown (2.5Y 5/2) medium and coarse sand; single grain; loose; about 10 percent gravel (few pebbles are 1 to 3 inches in diameter); strongly effervescent; slightly alkaline; abrupt wavy boundary.

2Cg3—68 to 80 inches; grayish brown (2.5Y 5/2) sand; single grain; loose; about 10 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Depth to contrasting material: 20 to 40 inches
Depth to carbonates: 20 to 40 inches

Ap and A horizons:
Hue—10YR, 2.5Y, or N
Value—2 or 3
Chroma—0 or 1
Texture—clay loam
Reaction—slightly acid to slightly alkaline

Bg horizon:
Hue—5Y, 5GY, or 2.5Y
Value—4 or 5
Chroma—1 to 3
Texture—loam, sandy clay loam, or clay loam
Reaction—neutral or slightly alkaline

2BCg horizon (if it occurs):
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 4
Texture—gravelly loam or gravelly sandy loam
Reaction—slightly acid to slightly alkaline

2Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—loamy sand, sand, coarse sand, or loamy coarse sand or the gravelly or very gravelly analogs of these textures
Reaction—slightly alkaline or moderately alkaline

Calco Series

Typical Pedon

Calco silty clay loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; 650 feet east and 700 feet south of the northwest corner of sec. 16, T. 95 N., R. 35 W., Logan Township; USGS Silver Lake, Iowa, topographic quadrangle; lat. 43 degrees 03 minutes 06 seconds N. and long. 94 degrees 59 minutes 28 seconds W., NAD 27:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few medium rounded strong brown (7.5YR 5/8) masses of iron; common fine fragments of snail shells; slightly effervescent; slightly alkaline; clear smooth boundary.

A1—8 to 17 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; common medium black (10YR 2/1) wormcasts; slightly effervescent; slightly alkaline; gradual wavy boundary.

A2—17 to 31 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; common medium black (10YR 2/1) wormcasts; slightly effervescent; moderately alkaline; gradual wavy boundary.

A3—31 to 42 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; few fine prominent light brownish gray (2.5Y 6/2) redoximorphic depletions; slightly effervescent; moderately alkaline; gradual wavy boundary.

A4—42 to 50 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; friable; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bg—50 to 65 inches; very dark gray (N 3/0) silty clay loam; weak fine and medium angular blocky structure parting to weak fine and medium subangular blocky; friable; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cg—65 to 80 inches; very dark gray (N 3/0) silty clay loam; massive; friable; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: More than 30 inches

Ap or A horizon:
Hue—10YR, 5Y, or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam
Reaction—slightly alkaline or moderately alkaline

Bg horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 to 6
Chroma—0 to 2
Texture—silty clay loam or silt loam
Reaction—slightly alkaline or moderately alkaline

Cg horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 to 6
Chroma—0 to 2
Texture—silty clay loam, silt loam, or loam
Reaction—slightly alkaline or moderately alkaline

Calcousta Series

Typical Pedon

Calcousta silty clay loam, depressional, 0 to 1 percent slopes, 2,400 feet north and 300 feet west of the southeast corner of sec. 20, T. 91 N., R. 27 W.; USGS Thor topographic quadrangle; lat. 42 degrees 40 minutes 47 seconds N. and long. 94 degrees 03 minutes 01 second W., NAD 27:

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; many fine and medium roots; strongly effervescent; slightly alkaline; clear smooth boundary.

Bkg—10 to 14 inches; olive gray (5Y 4/2) silty clay loam; weak fine and medium subangular blocky structure; friable; many fine and medium roots; very few prominent very dark gray (10YR 3/1) organic coatings; common fine rounded light gray (10YR 7/2) carbonate concretions; common fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; clear smooth boundary.

Cg1—14 to 30 inches; olive gray (5Y 5/2) silty clay loam; massive; friable; common fine and medium roots; common fine rounded light gray (10YR 7/2) carbonate concretions; common fine prominent brown (7.5YR 4/4) and strong brown (7.5YR 4/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; gradual smooth boundary.

Cg2—30 to 45 inches; olive gray (5Y 5/2) silt loam; massive; friable; common fine and medium roots; common fine rounded light gray (10YR 7/2) carbonate concretions; common fine and medium prominent yellowish brown (10YR 5/6 and 5/8) redoximorphic concentrations; violently effervescent; moderately alkaline; gradual smooth boundary.

Cg3—45 to 60 inches; olive gray (5Y 5/2) silt loam; massive; friable; common fine and medium roots; common fine rounded light gray (10YR 7/2) carbonate concretions; common fine and medium prominent yellowish brown (10YR 5/6 and 5/8) redoximorphic concentrations; violently effervescent; slightly alkaline.

Range in Characteristics

Thickness of the solum: 10 to 24 inches
Depth to carbonates: 0 to 10 inches
Thickness of the mollic epipedon: 9 to 18 inches

Ap or A horizon:
Hue—10YR or N
Value—2
Chroma—0 or 1
Texture—silty clay loam
Reaction—slightly alkaline or moderately alkaline

Bkg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam
Reaction—slightly alkaline or moderately alkaline

Cg horizon:
Hue—5Y
Value—5 or 6
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—slightly alkaline or moderately alkaline

Canisteo Series

Typical Pedon

Canisteo clay loam, 0 to 2 percent slopes, in a cultivated field; 1,600 feet west and 100 feet south of the northeast corner of sec. 4, T. 97 N., R. 35 W., Lake Township; USGS Terril, Iowa, topographic quadrangle;

lat. 43 degrees 15 minutes 16 seconds N. and long. 94 degrees 58 minutes 45 seconds W., NAD 27:

Ap—0 to 8 inches; black (N 2/0) clay loam, black (10YR 2/1) dry; weak fine granular structure; friable; common very fine roots; about 5 percent fine gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

A—8 to 17 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; weak fine and medium granular structure; friable; common very fine roots; about 5 percent gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

AB—17 to 23 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR 4/1) dry; weak fine and medium granular structure; friable; common very fine roots; about 5 percent gravel; common medium prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; gradual smooth boundary.

Bkg1—23 to 36 inches; olive gray (5Y 5/2) loam; moderate medium subangular blocky structure; friable; common fine rounded very pale brown (10YR 8/2) carbonate nodules; few medium rounded yellowish red (5YR 4/6) masses of iron and common fine rounded black (10YR 2/1) iron-manganese nodules; about 5 percent gravel; common medium prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; gradual smooth boundary.

Bkg2—36 to 64 inches; light olive gray (5Y 6/2) loam; moderate medium subangular blocky structure; friable; common fine rounded very pale brown (10YR 8/2) calcium carbonate nodules; few medium rounded yellowish red (5YR 4/6) masses of iron; common fine rounded black (10YR 2/1) iron-manganese nodules; about 5 percent gravel; common medium prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; gradual smooth boundary.

Cg—64 to 80 inches; light olive gray (5Y 6/2) sandy loam; massive; friable; about 5 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Thickness of the mollic epipedon: 14 to 24 inches

Ap and A horizons:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—clay loam
Reaction—slightly alkaline or moderately alkaline

Bkg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—clay loam, loam, silty clay loam, silt loam, or sandy loam
Reaction—slightly alkaline or moderately alkaline

Cg horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—1 to 4
Texture—loam or sandy loam
Reaction—slightly alkaline or moderately alkaline

Clarion Series

Taxadjunct features: The Clarion soils in map units 138C2 and 638C2 do not have a mollic epipedon. These soils are classified as fine-loamy, mixed, superactive, mesic Typic Eutrudepts.

Typical Pedon

Clarion loam, 2 to 5 percent slopes, in a cultivated field; 63 feet west and 1,400 feet north of the southeast corner of sec. 21, T. 95 N., R. 35 W., Logan Township; USGS Silver Lake, Iowa, topographic quadrangle; lat. 43 degrees 01 minute 38 seconds N. and long. 94 degrees 58 minutes 23 seconds W., NAD 27:

Ap—0 to 8 inches; very dark brown (10YR 2/2) loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; common fine and medium roots; about 1 percent gravel; neutral; abrupt smooth boundary.

AB—8 to 16 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak very fine subangular blocky structure; friable; common fine and medium roots; many distinct very dark gray (10YR 3/1) organic coatings on faces of peds; about 1 percent gravel; neutral; clear wavy boundary.

Bw1—16 to 23 inches; brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; common fine and medium roots; few distinct dark brown (10YR 3/3) organic coatings on faces of peds; about 1 percent gravel; neutral; gradual smooth boundary.

Bw2—23 to 31 inches; dark yellowish brown (10YR 4/4) loam; weak fine and medium subangular blocky structure; friable; common distinct brown

(10YR 3/3) organic coatings on faces of peds; about 1 percent gravel; neutral; clear wavy boundary.

Bk—31 to 39 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; friable; common fine and medium very pale brown (10YR 8/2) calcium carbonate threads; about 3 percent gravel; slightly effervescent; slightly alkaline; abrupt wavy boundary.

C1—39 to 54 inches; mixed yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) loam; massive; friable; common medium and coarse very pale brown (10YR 8/2) calcium carbonate threads; about 3 percent gravel; common fine distinct yellowish brown (10YR 5/6) redoximorphic concentrations; common fine prominent grayish brown (2.5Y 5/2) redoximorphic depletions; strongly effervescent; slightly alkaline; gradual smooth boundary.

C2—54 to 80 inches; yellowish brown (10YR 5/4) loam; massive; friable; common coarse yellowish red (5YR 4/6) masses of iron; common fine and medium very pale brown (10YR 8/2) masses of calcium carbonate; about 3 percent gravel; common fine and medium distinct yellowish brown (10YR 5/6) redoximorphic concentrations; common fine and medium prominent grayish brown (2.5Y 5/2) redoximorphic depletions; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 18 to 50 inches
Thickness of the mollic epipedon: 10 to 20 inches

Ap and AB horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam
Reaction—neutral or slightly acid

Bw horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—loam
Reaction—neutral or slightly acid

Bk and C horizons:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—loam or sandy loam
Reaction—slightly alkaline or moderately alkaline

Coland Series

Typical Pedon

Coland clay loam, 0 to 2 percent slopes, occasionally flooded, in a pasture; 1,734 feet east and 207 feet south of the northwest corner of sec. 23, T. 97 N., R. 36 W., Meadow Township; USGS Dickens, Iowa, topographic quadrangle; lat. 43 degrees 12 minutes 43 seconds N. and long. 95 degrees 03 minutes 57 seconds W., NAD 27:

A1—0 to 7 inches; black (N 2/0) clay loam, black (10YR 2/1) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; neutral; clear smooth boundary.

A2—7 to 16 inches; black (N 2/0) clay loam, black (10YR 2/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; neutral; gradual smooth boundary.

A3—16 to 23 inches; black (N 2/0) clay loam, black (10YR 2/1) dry; weak medium and fine subangular blocky structure; friable; neutral; gradual smooth boundary.

A4—23 to 31 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; weak medium and fine angular and subangular blocky structure; friable; few fine prominent strong brown (7.5YR 4/6) redoximorphic concentrations; neutral; clear smooth boundary.

A5—31 to 42 inches; very dark gray (10YR 3/1) silty clay loam that has a high content of fine sand; dark gray (10YR 4/1) dry; weak medium and fine angular and subangular blocky structure; friable; common medium prominent strong brown (7.5YR 4/6) redoximorphic concentrations and coatings on faces of peds; neutral; clear smooth boundary.

AC—42 to 48 inches; black (5Y 2/1) clay loam that has a high content of fine sand; weak fine prismatic structure parting to weak fine subangular blocky; friable; neutral; abrupt wavy boundary.

C1—48 to 68 inches; black (5Y 2/1) clay loam; massive; friable; slightly effervescent; slightly alkaline; clear smooth boundary.

C2—68 to 80 inches; black (5Y 2/1) sandy loam; single grain; loose; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 48 to 60 inches
Thickness of the mollic epipedon: 36 inches or more

A horizon:
Hue—10YR or N

Value—2 or 3
Chroma—0 or 1
Texture—clay loam or silty clay loam
Reaction—slightly acid or neutral

AC horizon:
Hue—10YR to 5Y or N
Value—2 to 4
Chroma—0 to 2
Texture—clay loam or loam
Reaction—slightly acid or neutral

C horizon:
Hue—2.5Y, 5Y, or N
Value—2 to 5
Chroma—0 to 2
Texture—clay loam, loam, or sandy loam
Reaction—slightly acid to slightly alkaline

Collinwood Series

Typical Pedon

Collinwood clay, 1 to 3 percent slopes, in a cultivated field; 465 feet south and 2,000 feet east of the northwest corner of sec. 13, T. 96 N., R. 36 W., Sioux Township; USGS Dickens, Iowa, topographic quadrangle; lat. 43 degrees 08 minutes 02 seconds N. and long. 95 degrees 02 minutes 35 seconds W., NAD 27:

Ap—0 to 8 inches; black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; moderate very fine and fine granular structure; very firm; common very fine roots; slightly alkaline; abrupt smooth boundary.

A1—8 to 13 inches; black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; moderate fine and medium granular structure; very firm; few very fine roots; neutral; clear smooth boundary.

A2—13 to 17 inches; very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; moderate very fine subangular blocky structure; very firm; few very fine roots; common distinct black (10YR 2/1) organic coatings on faces of peds; neutral; clear smooth boundary.

Bg—17 to 24 inches; dark grayish brown (2.5Y 4/2) clay; strong fine angular blocky structure; very firm; few very fine roots; common distinct very dark gray (10YR 3/1) organic coatings on faces of peds; common grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) pressure faces; few fine rounded black (N 2/0) iron-manganese concretions; common fine distinct olive brown (2.5Y 4/4) redoximorphic concentrations; slightly effervescent; slightly alkaline; abrupt wavy boundary.

Bkg1—24 to 32 inches; dark grayish brown (2.5Y 4/2) clay; strong fine angular blocky structure; very firm; few very fine roots; common distinct very dark gray (10YR 3/1) organic coatings on faces of peds; common grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) pressure faces; common fine and medium irregular very pale brown (10YR 8/2) calcium carbonate nodules; common fine distinct olive brown (2.5Y 4/4) redoximorphic concentrations; slightly effervescent; slightly alkaline; gradual smooth boundary.

Bkg2—32 to 41 inches; grayish brown (2.5Y 5/2) clay; strong very fine prismatic structure parting to strong fine and medium angular blocky; very firm; common distinct very dark gray (10YR 3/1) organic coatings on faces of prisms and peds; common fine and medium irregular very pale brown (10YR 8/2) calcium carbonate nodules; common fine and medium distinct light olive brown (2.5Y 5/4) and few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; gradual smooth boundary.

Bkg3—41 to 53 inches; grayish brown (2.5Y 5/2) silty clay; strong very fine prismatic structure parting to strong medium angular blocky; very firm; common distinct very dark gray (10YR 3/1) organic coatings on faces of prisms and peds; common fine and medium irregular very pale brown (10YR 8/2) calcium carbonate nodules; common fine and medium distinct light olive brown (2.5Y 5/4) and few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; clear smooth boundary.

BCg—53 to 65 inches; mixed light olive brown (2.5Y 5/4) and olive gray (5Y 5/2) clay; strong fine prismatic structure; very firm; few fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; gradual smooth boundary.

Cg—65 to 80 inches; mixed light olive brown (2.5Y 5/4) and olive gray (5Y 5/2) clay; massive; very firm; few fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 24 to 46 inches
Thickness of the mollic epipedon: 14 to 24 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3

Chroma—1
Texture—clay

Bg and Bkg horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 in the upper part; 2 to 4 in the lower part
Texture—clay or silty clay

BCg and Cg horizons:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—2 to 4
Texture—clay, silty clay, silty clay loam, or silt loam

Colo Series

Typical Pedon

Colo silty clay loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; 600 feet north and 30 feet west of the southeast corner of sec. 8, T. 94 N., R. 36 W., Herdland Township; USGS Webb, Iowa, topographic quadrangle; lat. 42 degrees 56 minutes 15 seconds N. and long. 95 degrees 06 minutes 45 seconds W., NAD 27:

Ap—0 to 8 inches; black (N 2/0) silty clay loam, black (10YR 2/1) dry; weak fine granular and weak fine subangular blocky structure; friable; common fine roots; neutral; abrupt smooth boundary.
A1—8 to 19 inches; black (N 2/0) silty clay loam, black (10YR 2/1) dry; moderate fine and medium subangular blocky and angular blocky structure; friable; common fine roots; neutral; gradual smooth boundary.
A2—19 to 28 inches; black (N 2/0) silty clay loam, black (10YR 2/1) dry; weak fine and medium subangular blocky structure; friable; common fine roots; neutral; gradual smooth boundary.
A3—28 to 40 inches; black (N 2/0 and 10YR 2/1) silty clay loam, black (10YR 2/1) and very dark gray (10YR 3/1) dry; weak fine and medium subangular blocky structure; friable; common fine roots; neutral; gradual smooth boundary.
A4—40 to 48 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure; friable; common fine roots; neutral; gradual smooth boundary.
Cg—48 to 80 inches; very dark gray (10YR 3/1) and very dark grayish brown (2.5Y 3/2) silty clay loam; massive; friable; neutral.

Range in Characteristics

Depth to carbonates: More than 60 inches
Thickness of the mollic epipedon: More than 36 inches

A horizon:
Hue—10YR to 5Y or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam
Reaction—neutral to moderately acid

BCg horizon (if it occurs):
Hue—10YR to 5Y or N
Value—3 to 6
Chroma—0 to 2
Texture—silty clay loam
Reaction—neutral to moderately acid

Cg horizon:
Hue—10YR to 5Y or N
Value—3 to 6
Chroma—0 to 2
Texture—silty clay loam, silt loam, or clay loam
Reaction—neutral or slightly acid

Cornell Series

Typical Pedon

Cornell silty clay loam, 18 to 25 percent slopes, in a pastured area of woodland; 400 feet east and 1,000 feet north of the southwest corner of sec. 28, T. 94 N., R. 36 W., Herdland Township; USGS Sioux Rapids, Iowa, topographic quadrangle; lat. 42 degrees 55 minutes 44 seconds N. and long. 95 degrees 06 minutes 30 seconds W., NAD 27:

A1—0 to 6 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common fine to coarse roots; slightly acid; clear smooth boundary.
A2—6 to 11 inches; very dark brown (10YR 2/2) (interior) and black (10YR 2/1) (exterior) silty clay loam, grayish brown (10YR 5/2) and dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; common fine to coarse roots; about 2 percent gravel; moderately acid; clear smooth boundary.
AB—11 to 16 inches; very dark grayish brown (10YR 3/2) (interior) and black (10YR 2/1) and very dark brown (10YR 2/2) (exterior) silty clay loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; common fine to coarse

roots; about 1 percent gravel; slightly acid; clear smooth boundary.

Bt1—16 to 21 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; firm; common fine to coarse roots; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds and in root channels; about 4 percent gravel; common fine prominent red (2.5YR 4/6) masses of iron on faces of peds; moderately acid; clear smooth boundary.

2Bt2—21 to 30 inches; dark yellowish brown (10YR 4/4) clay; moderate fine prismatic structure parting to strong fine and medium subangular blocky; firm; common fine to coarse roots; few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds and in root channels; few fine and medium red (2.5YR 4/6) masses of iron on faces of peds; about 4 percent gravel; common fine prominent strong brown (7.5YR 4/6) redoximorphic concentrations; common medium distinct dark grayish brown (10YR 4/2) redoximorphic depletions; strongly acid; clear smooth boundary.

2Bt3—30 to 43 inches; dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) clay; moderate medium prismatic structure parting to strong medium angular blocky; firm; common fine to coarse roots; few fine and medium red (2.5YR 4/6) masses of iron on faces of peds; about 6 percent gravel; common fine prominent strong brown (7.5YR 4/6) and common fine distinct yellowish brown (10YR 5/6) redoximorphic concentrations on faces of peds; strongly acid; abrupt wavy boundary.

2Bt4—43 to 54 inches; dark yellowish brown (10YR 4/4) clay loam; moderate coarse prismatic structure parting to moderate medium and coarse angular blocky; firm; common fine roots between peds; about 3 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

2Bt5—54 to 62 inches; yellowish brown (10YR 5/6) clay loam; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; common fine roots; few prominent very dark grayish brown (10YR 3/2) clay films on faces of peds; about 8 percent gravel; common fine prominent grayish brown (10YR 5/2) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual wavy boundary.

2Bt6—62 to 70 inches; yellowish brown (10YR 5/6) clay loam; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; common fine roots; few distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; about 9 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

2BC—70 to 80 inches; yellowish brown (10YR 5/6) clay loam; weak very coarse prismatic structure; firm; common fine roots; few prominent very dark grayish brown (10YR 3/2) clay films on faces of peds; about 7 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: More than 40 inches
Thickness of the mollic epipedon: 10 to 20 inches
Depth to till: 10 to 30 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam or clay loam
Reaction—moderately acid or slightly acid

Bt and 2Bt horizons:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 6
Texture—clay loam, silty clay loam, silty clay, or clay
Reaction—strongly acid to moderately alkaline

2BC horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 6
Texture—loam or clay loam
Reaction—slightly alkaline or moderately alkaline

Crippin Series

Typical Pedon

Crippin loam, 1 to 3 percent slopes, in a cultivated field; 225 feet north and 1,320 feet west of the southeast corner of sec. 3, T. 94 N., R. 35 W., Garfield Township; USGS Rush Lake, Iowa, topographic quadrangle; lat. 42 degrees 58 minutes 59 seconds N. and long. 94 degrees 57 minutes 30 seconds W., NAD 27:

Ap—0 to 8 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; slightly alkaline; abrupt wavy boundary.

A1—8 to 14 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; slightly effervescent; slightly alkaline; gradual smooth boundary.

A2—14 to 18 inches; very dark gray (10YR 3/1) loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; about 2 percent gravel; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—18 to 24 inches; dark grayish brown (10YR 4/2) loam; weak fine subangular blocky structure; friable; common distinct very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) organic coatings on faces of peds; about 2 percent gravel; slightly effervescent; slightly alkaline; gradual smooth boundary.

Bk1—24 to 28 inches; mottled dark grayish brown (10YR 4/2), grayish brown (2.5Y 5/2), and yellowish brown (10YR 5/4) loam; weak fine and medium subangular blocky structure; friable; common fine irregular very pale brown (10YR 8/2) calcium carbonate nodules; about 3 percent gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—28 to 39 inches; grayish brown (2.5Y 4/2) loam; moderate fine and medium subangular blocky structure; friable; common fine dark manganese concretions; common fine irregular very pale brown (10YR 8/2) calcium carbonate nodules; about 3 percent gravel; many fine prominent yellowish brown (10YR 5/4) redoximorphic concentrations; strongly effervescent; moderately alkaline; abrupt wavy boundary.

C1—39 to 55 inches; mottled grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) loam; massive; friable; many fine dark manganese concretions; common fine irregular very pale brown (10YR 8/2) calcium carbonate nodules; about 3 percent gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—55 to 68 inches; yellowish brown (10YR 5/4) loam; massive; friable; many fine dark manganese concretions; common fine irregular very pale brown (10YR 8/2) calcium carbonate nodules; about 3 percent gravel; common fine and medium prominent grayish brown (2.5YR 5/2) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual smooth boundary.

C3—68 to 80 inches; yellowish brown (10YR 5/4) loam; massive; friable; common fine dark manganese concretions; about 3 percent gravel; many medium prominent strong grayish brown (2.5YR 5/2) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Thickness of the mollic epipedon: 12 to 20 inches

Ap and A horizons:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—loam
Reaction—slightly alkaline or moderately alkaline

Bw horizon:
Hue—10YR or 2.5Y
Value—4
Chroma—2
Texture—loam
Reaction—slightly alkaline or moderately alkaline

Bk horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 to 4
Texture—loam or clay loam
Reaction—slightly alkaline or moderately alkaline

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—loam or clay loam
Reaction—slightly alkaline or moderately alkaline

Cylinder Series

Typical Pedon

Cylinder loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes, in a cultivated field; 123 feet south and 1,278 feet east of the northwest corner of sec. 11, T. 96 N., R. 38 W., Lone Tree Township; USGS Everly, Iowa, topographic quadrangle; lat. 43 degrees 09 minutes 18 seconds N. and long. 95 degrees 18 minutes 12 seconds W., NAD 27:

Ap—0 to 8 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common very fine and fine roots; slightly acid; clear smooth boundary.

A1—8 to 14 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common very fine and fine roots; slightly acid; gradual smooth boundary.

A2—14 to 18 inches; very dark grayish brown (2.5Y 3/2) loam, grayish brown (2.5Y 5/2) dry; weak fine granular structure; friable; common very fine and fine roots; few very dark grayish brown (10YR 3/2) and black (10YR 2/1) coatings on faces of peds; neutral; clear smooth boundary.

Bg1—18 to 24 inches; dark grayish brown (2.5Y 4/2) clay loam; weak fine and medium subangular blocky structure; friable; common very fine and fine roots; very dark grayish brown (2.5Y 3/2) and very dark gray (10YR 3/1) coatings on faces of peds; common fine distinct light olive brown (2.5Y 5/4) redoximorphic concentrations; neutral; gradual smooth boundary.

Bg2—24 to 28 inches; mixed dark grayish brown (2.5Y 4/2) and olive brown (2.5Y 4/3) loam; very weak fine subangular blocky structure; friable; common fine very dark grayish brown (2.5Y 3/2) dark masses; about 5 percent gravel; common fine faint dark yellowish brown (10YR 4/4) redoximorphic concentrations; neutral; clear smooth boundary.

2BC—28 to 39 inches; dark brown (10YR 3/3) and dark yellowish brown (10YR 3/4) medium and coarse sand; single grain; loose; about 5 percent gravel; slightly effervescent; slightly alkaline; gradual smooth boundary.

2C1—39 to 50 inches; grayish brown (10YR 5/2) and brown (10YR 5/3) very gravelly loamy sand; single grain; loose; about 35 percent gravel; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2C2—50 to 80 inches; light brownish gray (10YR 6/2) and pale brown (10YR 6/3) very gravelly loamy sand; single grain; loose; about 35 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 14 to 24 inches
Depth to contrasting material: 24 to 40 inches

Ap and A horizons:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—loam
Reaction—moderately acid to neutral

Bg horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 or 3
Texture—loam or clay loam
Reaction—slightly acid or neutral

2BC and 2C horizons:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—2 to 8
Texture—sand or loamy sand or the gravelly or very gravelly analogs of these textures
Reaction—slightly alkaline or moderately alkaline

Dickinson Series

Taxadjunct features: The Dickinson soil in map unit 874C2 does not have a mollic epipedon. This soil is classified as a coarse-loamy, mixed, superactive, mesic Typic Eutrudept.

Typical Pedon

Dickinson fine sandy loam, 2 to 5 percent slopes, in a cultivated field; 1,700 feet south and 1,000 feet west of the northeast corner of sec. 32, T. 96 N., R. 36 W., Sioux Township; USGS Gillette Grove, Iowa, topographic quadrangle; lat. 43 degrees 05 minutes 43 seconds N. and long. 95 degrees 07 minutes 07 seconds W., NAD 27:

Ap—0 to 7 inches; very dark brown (10YR 2/2) fine sandy loam, very dark grayish brown (10YR 3/2) dry; weak very fine granular structure; very friable; common very fine and fine roots; moderately acid; abrupt smooth boundary.

AB—7 to 13 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak very fine subangular blocky structure parting to weak fine granular; very friable; common very fine and fine roots; moderately acid; clear smooth boundary.

Bw1—13 to 24 inches; brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure; very friable; common very fine and fine roots; moderately acid; gradual smooth boundary.

Bw2—24 to 31 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots; moderately acid; diffuse smooth boundary.

BC—31 to 41 inches; mixed dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) loamy sand; weak coarse subangular blocky structure; very friable; common very fine and fine roots; slightly acid; clear smooth boundary.

C1—41 to 64 inches; yellowish brown (10YR 5/4) sand; single grain; loose; slightly acid; clear smooth boundary.

C2—64 to 80 inches; yellowish brown (10YR 5/4) sand; single grain; loose; few fine white (10YR 8/1) calcium carbonate concretions between sand grains; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 12 to 24 inches
Depth to carbonates: 60 inches or more
Other features: A lacustrine substratum phase is

recognized. The lacustrine material is below a depth of 60 inches. It has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 to 4. The texture is silt loam, silty clay loam, silty clay, or clay. Reaction ranges from slightly acid to moderately alkaline.

Ap and AB horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam
Reaction—neutral to moderately acid

Bw horizon:
Hue—10YR
Value—3 or 4
Chroma—2 to 4
Texture—sandy loam or fine sandy loam
Reaction—slightly acid or moderately acid

BC and C horizons:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—3 to 6
Texture—loamy fine sand, loamy sand, fine sand, or sand
Reaction—slightly acid or moderately acid

Dickman Series

Typical Pedon

Dickman sandy loam, on a convex slope of 1 percent, in a cultivated field; about 1.5 miles north of Redwood Falls, in Redwood County, Minnesota; 2,240 feet west and 2,500 feet south of the northeast corner of sec. 25, T. 113 N., R. 36 W.; USGS Redwood Falls quadrangle; lat. 44 degrees 33 minutes 53 seconds N. and long. 95 degrees 07 minutes 21 seconds W., NAD 27:

Ap—0 to 10 inches; black (10YR 2/1) sandy loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.
A—10 to 12 inches; very dark gray (10YR 3/1) sandy loam, dark brown (10YR 3/3) dry; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.
Bw1—12 to 16 inches; brown (10YR 4/3) sandy loam; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.
Bw2—16 to 19 inches; dark brown (10YR 4/3) sandy loam; dark grayish brown (10YR 4/2) on faces of peds; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.
2Bw3—19 to 33 inches; dark brown (10YR 4/3) loamy sand; single grain; loose; neutral; clear smooth boundary.
2C1—33 to 68 inches; yellowish brown (10YR 5/4) coarse sand; single grain; loose; neutral; gradual wavy boundary.
2C2—68 to 80 inches; brown (10YR 5/3) sand; single grain; loose; slightly effervescent; slightly alkaline.

Range in Characteristics

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam, coarse sandy loam, or sandy loam
Reaction—slightly acid or moderately acid

Bw horizon:
Hue—10YR or 7.5YR
Value—3 or 4
Chroma—3 or 4
Texture—coarse sandy loam, fine sandy loam, or sandy loam
Reaction—moderately acid to neutral

2Bw horizon:
Hue—10YR, 7.5YR, or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loamy sand, loamy fine sand, fine sand, coarse sand, or sand
Reaction—moderately acid to neutral

2C horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—coarse sand, sand, or fine sand or strata with these textures
Reaction—slightly acid to slightly alkaline

Estherville Series

Taxadjunct features: The Estherville soil in map unit 541C does not have a mollic epipedon. This soil is classified as a sandy, mixed, mesic Typic Eutrudept.

Typical Pedon

Estherville sandy loam, in an area of Estherville-Hawick complex, 5 to 9 percent slopes, in a cultivated field; 320 feet west and 2,340 feet south of the northeast corner of sec. 23, T. 94 N., R. 35 W., Garfield Township;

USGS Rush Lake West, Iowa, topographic quadrangle; lat. 42 degrees 56 minutes 50 seconds N. and long. 94 degrees 56 minutes 06 seconds W., NAD 27:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) sandy loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; common very fine and fine roots; slightly acid; abrupt smooth boundary.

Bw—7 to 18 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots; few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; clear smooth boundary.

2C1—18 to 37 inches; brown (10YR 4/3) very gravelly sand; single grain; loose; about 45 percent gravel; slightly effervescent; slightly alkaline; clear smooth boundary.

2C2—37 to 60 inches; yellowish brown (10YR 5/4) very gravelly sand; single grain; loose; about 55 percent gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

2C3—60 to 80 inches; yellowish brown (10YR 5/4) very gravelly coarse sand; single grain; loose; about 59 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the loamy mantle: 10 to 20 inches
Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 18 to 30 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam
Reaction—neutral to moderately acid

Bw horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—sandy loam
Reaction—neutral to moderately acid

2C horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—very gravelly sand or very gravelly coarse sand
Reaction—neutral to moderately alkaline

Everly Series

Taxadjunct features: The Everly soils in map units 577C2 and 637D2 do not have a mollic epipedon. These soils are classified as fine-loamy, mixed, superactive, mesic Typic Eutrudepts.

Typical Pedon

Everly clay loam, 2 to 5 percent slopes, in a cultivated field; 880 feet north and 340 feet east of the southwest corner of sec. 13, T. 97 N., R. 37 W., Summit Township; USGS Spencer, Iowa, topographic quadrangle; lat. 43 degrees 12 minutes 57 seconds N. and long. 95 degrees 10 minutes 06 seconds W., NAD 27:

Ap—0 to 8 inches; black (10YR 2/1) clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common very fine and fine roots; moderately acid; abrupt smooth boundary.

A—8 to 12 inches; black (10YR 2/1) clay loam with a few small streaks and pockets of very dark grayish brown (10YR 3/2) clay loam; very dark gray (10YR 3/1) and dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; common fine and very fine roots; moderately acid; gradual smooth boundary.

BA—12 to 16 inches; mixed black (10YR 2/1) and very dark grayish brown (10YR 3/2) clay loam; moderate fine and very fine subangular blocky structure; friable; common fine and very fine roots; slightly acid; gradual smooth boundary.

Bw1—16 to 20 inches; brown (10YR 4/3) clay loam; moderate fine subangular blocky structure; friable; common very fine and fine roots; about 2 percent gravel; slightly acid; gradual smooth boundary.

Bw2—20 to 26 inches; brown (10YR 4/3) clay loam; weak fine subangular blocky structure; friable; common very fine and fine roots; common distinct very dark gray (10YR 3/1) organic coatings on faces of peds; a thin discontinuous band of pebbles in the lower part of the horizon; about 3 percent gravel; neutral; clear smooth boundary.

2Bk1—26 to 36 inches; dark yellowish brown (10YR 4/4) loam; weak fine subangular blocky structure; firm; few white (10YR 8/1) calcium carbonate nodules in the lower part; about 3 percent gravel; few fine distinct dark gray (10YR 3/1) redoximorphic depletions in the lower part; strongly effervescent; moderately alkaline; gradual smooth boundary.

2Bk2—36 to 50 inches; yellowish brown (10YR 5/4) loam; weak fine prismatic structure; firm; common white (10YR 8/1) calcium carbonate nodules; about 5 percent gravel; few fine distinct grayish brown (10YR 5/2) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual smooth boundary.

2BC1—50 to 62 inches; yellowish brown (10YR 5/4) loam; weak and moderate coarse prismatic structure; firm; common white (10YR 8/1) calcium carbonate nodules; about 5 percent gravel; common medium faint dark yellowish brown (10YR 4/4) redoximorphic concentrations; few fine distinct grayish brown (10YR 5/2) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual smooth boundary.

2BC2—62 to 80 inches; yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) clay loam; moderate coarse and very coarse prismatic structure; firm; common white (10YR 8/1) calcium carbonate nodules; about 7 percent gravel; few medium and fine distinct yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 16 to 36 inches
Thickness of the mollic epipedon: 10 to 20 inches
Depth to till: 16 to 36 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—clay loam
Reaction—neutral to moderately acid

BA horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—clay loam
Reaction—neutral to moderately acid

Bw horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—clay loam or loam
Reaction—slightly acid or neutral

2Bk or 2BC horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—clay loam or loam
Reaction—slightly alkaline or moderately alkaline

Fairhaven Series

Typical Pedon

Fairhaven silt loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes, in a cultivated field; 50 feet north and 610 feet east of the southwest corner of sec. 34, T. 97 N., R. 38 W., Waterford Township; USGS Everly, Iowa, topographic quadrangle; lat. 43 degrees 10 minutes 15 seconds N. and long. 95 degrees 15 minutes 00 seconds W., NAD 27:

Ap—0 to 7 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common fine roots; moderately acid; abrupt smooth boundary.

A—7 to 12 inches; black (10YR 2/1) and very dark brown (10YR 2/2) silt loam, very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) dry; weak fine granular and weak fine subangular blocky structure; friable; common fine roots; moderately acid; clear smooth boundary.

Bw1—12 to 17 inches; dark brown (10YR 3/3) silt loam, brown (10YR 4/3) and very dark grayish brown (10YR 3/2) dry; weak fine and medium subangular blocky structure; friable; common fine roots; very dark brown (10YR 2/2) organic coatings on faces of peds; moderately acid; clear smooth boundary.

Bw2—17 to 28 inches; brown (10YR 4/3) and dark yellowish brown (10YR 4/4) loam; weak fine and medium subangular blocky structure; friable; common fine roots; few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; moderately acid; clear smooth boundary.

Bw3—28 to 36 inches; dark yellowish brown (10YR 4/4) loam; weak fine and medium subangular blocky structure; friable; brown (7.5YR 4/4) iron stains on faces of peds; neutral; clear smooth boundary.

2BC—36 to 39 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine subangular blocky structure; friable; brown (7.5YR 4/4) iron stains on faces of peds; about 3 percent gravel; slightly effervescent; moderately alkaline; gradual smooth boundary.

2C1—39 to 48 inches; dark yellowish brown (10YR 4/4) coarse sand; single grain; loose; about 3 percent gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

2C2—48 to 55 inches; yellowish brown (10YR 5/4) sand; single grain; loose; about 5 percent gravel; slightly effervescent; moderately alkaline; gradual wavy boundary.

2C3—55 to 80 inches; yellowish brown (10YR 5/4) coarse sand; single grain; loose; about 5 percent gravel; very slightly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 20 to 50 inches
Thickness of the mollic epipedon: 10 to 22 inches
Depth to contrasting material: 22 to 40 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam or silt loam
Reaction—neutral to moderately acid

Bw horizon:
Hue—10YR
Value—3 to 5
Chroma—3 or 4
Texture—loam or silt loam
Reaction—neutral to moderately acid

2BC horizon:
Hue—10YR
Value—3 to 5
Chroma—3 or 4
Texture—sandy loam
Reaction—slightly acid to moderately alkaline

2C horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 5
Texture—gravelly coarse sand, coarse sand, or sand
Reaction—slightly alkaline or moderately alkaline

Fostoria Series

Typical Pedon

Fostoria loam, 1 to 3 percent slopes, in a cultivated field; 125 feet north and 150 feet west of the southeast corner of sec. 29, T. 97 N., R. 38 W., Waterford Township; USGS Everly, Iowa, topographic quadrangle; lat. 43 degrees 11 minutes 03 seconds N. and long. 95 degrees 20 minutes 54 seconds W., NAD 27:

Ap—0 to 7 inches; black (N 2/0) loam, very dark gray (10YR 3/1) dry; moderate fine and medium granular structure; friable; common very fine and fine roots; neutral; abrupt smooth boundary.

A1—7 to 15 inches; black (N 2/0) loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common very fine and fine roots; neutral; gradual smooth boundary.

A2—15 to 19 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; some mixing of dark grayish brown (2.5Y 4/2); weak very fine subangular blocky and weak fine granular structure; friable; common very fine and fine roots; neutral; gradual smooth boundary.

Bg1—19 to 24 inches; dark grayish brown (2.5Y 4/2) loam; very weak fine subangular blocky structure; friable; common very fine roots; very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; gradual smooth boundary.

Bg2—24 to 29 inches; dark grayish brown (2.5Y 4/2) loam; weak fine subangular blocky structure; friable; common very fine roots; common fine distinct olive brown (2.5Y 4/4) redoximorphic concentrations; neutral; gradual smooth boundary.

Bk—29 to 34 inches; olive brown (2.5Y 4/4) loam; weak fine and medium subangular blocky structure; friable; common very fine roots; common fine and medium very pale brown (10YR 8/2) calcium carbonate concretions; fine distinct light olive brown (2.5Y 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; abrupt wavy boundary.

2C—34 to 42 inches; light olive brown (2.5Y 5/4) silt loam; massive; friable; common fine and medium rounded very pale brown (10YR 8/2) calcium carbonate concretions; common fine distinct yellowish brown (10YR 5/6 and 5/8) redoximorphic concentrations; common medium prominent gray (10YR 5/1) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual smooth boundary.

2Cg1—42 to 60 inches; gray (10YR 5/1) silt loam; massive; friable; common fine and medium very pale brown (10YR 8/2) calcium carbonate concretions; many fine and medium prominent yellowish brown (10YR 5/6 and 5/8) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual smooth boundary.

2Cg2—60 to 68 inches; grayish brown (2.5Y 5/2) silt loam; massive; friable; many fine and medium prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; abrupt wavy boundary.

3C—68 to 80 inches; yellowish brown (10YR 5/6) loam; massive; firm; about 3 percent gravel; common fine prominent grayish brown (2.5Y 5/2) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 24 to 48 inches
Thickness of the mollic epipedon: 12 to 24 inches
Other features: A lacustrine substratum phase is recognized. The lacustrine material is below a depth of 60 inches. It has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 1 to 4. The texture is silt loam, silty clay loam, silty clay, or clay. Reaction is slightly alkaline or moderately alkaline.

Ap and A horizons:
Hue—10YR or N
Value—2
Chroma—0 or 1
Texture—loam
Reaction—slightly acid or neutral

BA or AB horizon (if it occurs):
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—2
Texture—loam, silt loam, or clay loam
Reaction—slightly acid or neutral

Bg and Bk horizons:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—loam, silt loam, or clay loam
Reaction—neutral to moderately alkaline

2Cg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 to 4
Texture—silt loam or loam
Reaction—slightly alkaline or moderately alkaline

3C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 to 6
Texture—loam or clay loam
Reaction—slightly alkaline or moderately alkaline

Galva Series

Typical Pedon

Galva silty clay loam, terrace, 2 to 5 percent slopes, in a cultivated field; 1,170 feet south and 415 feet east of the northwest corner of sec. 33, T. 94 N., R. 36 W., Webb Township; USGS Webb, Iowa, topographic quadrangle; lat. 42 degrees 55 minutes 17 seconds N. and long. 95 degrees 06 minutes 36 seconds W., NAD 27:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.
A—8 to 18 inches; black (10YR 2/1) and very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) dry; weak fine and medium granular structure; friable; slightly acid; clear smooth boundary.
Bw1—18 to 25 inches; brown (10YR 4/3) silty clay loam; weak fine and medium subangular blocky structure; friable; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds and in pores; slightly acid; clear smooth boundary.
Bw2—25 to 34 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak fine and medium subangular blocky structure; friable; slightly acid; clear smooth boundary.
Bw3—34 to 48 inches; mixed dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) silty clay loam; weak medium and coarse subangular blocky structure; friable; slightly acid; gradual smooth boundary.
BC—48 to 69 inches; yellowish brown (10YR 5/4) silt loam; weak fine and medium prismatic structure parting to weak medium and coarse subangular blocky; friable; few distinct dark brown (10YR 3/3) organic coatings on faces of peds; slightly effervescent; moderately alkaline; clear smooth boundary.
C—69 to 80 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; slightly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to contrasting material: More than 60 inches

Ap horizon:
Hue—10YR
Value—2
Chroma—1 or 2
Texture—silty clay loam
Reaction—slightly acid or moderately acid

Bw and BC horizons:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silty clay loam or silt loam

Reaction—slightly acid or neutral in the Bw horizon; neutral to moderately alkaline in the BC horizon

C horizon:

Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—dominantly silt loam; moderately coarse substratum phases of fine sand, loamy sand, or sand are recognized
Reaction—slightly alkaline or moderately alkaline

Gillett Grove Series

Typical Pedon

Gillett Grove silty clay loam, 0 to 2 percent slopes, in a cultivated field; 2,500 feet west and 2,000 feet north of the southeast corner of sec. 19, T. 95 N., R. 36 W., Gillette Grove Township; USGS Greenville, Iowa, topographic quadrangle; lat. 43 degrees 01 minute 50 seconds N. and long. 95 degrees 08 minutes 26 seconds W., NAD 27:

Ap—0 to 7 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.
A—7 to 11 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; neutral; gradual smooth boundary.
AB—11 to 16 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; friable; common medium prominent dark gray (5Y 4/1) redoximorphic depletions; neutral; gradual smooth boundary.
Bg1—16 to 22 inches; dark gray (2.5Y 4/1) silty clay loam; moderate fine and medium angular and subangular blocky structure; friable; common very dark gray (5Y 3/1) organic coatings on faces of peds; common fine dark manganese concretions that increase in abundance with increasing depth; common medium distinct dark gray (5Y 4/1) redoximorphic depletions; neutral; gradual smooth boundary.
Bg2—22 to 42 inches; olive gray (5Y 4/2) silty clay loam; weak fine and medium subangular blocky structure; friable; common fine dark manganese concretions; common fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; common medium faint dark gray (5Y 4/1) redoximorphic depletions; slightly effervescent; slightly alkaline; gradual wavy boundary.
BCg1—42 to 48 inches; grayish brown (2.5Y 5/2) silt loam; weak coarse prismatic structure parting to weak fine and medium subangular blocky; friable; common fine dark manganese concretions that increase in abundance with increasing depth; white (10YR 8/1) and pale brown (10YR 7/1) calcium carbonate coatings on faces of peds and root channels; common medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual wavy boundary.
2BCg2—48 to 80 inches; grayish brown (2.5Y 5/2) clay loam; weak coarse prismatic structure parting to weak fine and medium subangular blocky; friable; common fine dark manganese concretions; white (10YR 8/1) calcium carbonate coatings on faces of peds; about 3 percent gravel; common fine and medium prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 24 to 48 inches
Thickness of the mollic epipedon: 14 to 24 inches
Depth to till: 40 to 60 inches

A horizon:

Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam
Reaction—slightly acid to slightly alkaline

Bg horizon:

Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay loam or silty clay
Reaction—slightly acid to moderately alkaline

BCg horizon:

Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silt loam
Reaction—slightly alkaline or moderately alkaline

2BCg horizon:

Hue—2.5Y or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—clay loam or loam
Reaction—slightly alkaline or moderately alkaline

Guckeen Series

Typical Pedon

Guckeen silty clay loam, on a slightly convex slope of 2 percent, in a cultivated field; in Waseca County, Minnesota; about 2 miles south and 4 miles west of Waldorf; 100 feet east and 100 feet north of the southwest corner of sec. 7, T. 105 N., R. 24 W.; USGS Mapleton Northeast topographic quadrangle; lat. 43 degrees 54 minutes 22 seconds N. and long. 93 degrees 46 minutes 04 seconds W., NAD 83:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam; weak very fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

A1—8 to 12 inches; black (10YR 2/1) silty clay; moderate fine subangular blocky structure; friable; moderately acid; clear smooth boundary.

A2—12 to 15 inches; very dark gray (10YR 3/1) silty clay; moderate fine subangular blocky structure; friable; moderately acid; clear smooth boundary.

Bw1—15 to 18 inches; dark grayish brown (2.5Y 4/2) silty clay; strong fine angular blocky structure; firm; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) coatings on faces of peds; common very dark gray (10YR 3/1) earthworm casts; moderately acid; clear smooth boundary.

Bw2—18 to 24 inches; grayish brown (2.5Y 4/2) silty clay; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; dark grayish brown (10YR 4/2) coatings on faces of peds; moderately acid; clear smooth boundary.

2Bw3—24 to 30 inches; grayish brown (2.5Y 5/2) clay loam; moderate coarse prismatic structure parting to moderate fine and medium subangular blocky; firm; dark grayish brown (10YR 4/2) coatings on faces of peds; about 5 percent rock fragments; slightly acid; clear smooth boundary.

2C—30 to 60 inches; grayish brown (2.5Y 5/2) clay loam; massive; friable; about 5 percent rock fragments; common medium faint olive gray (5Y 5/2) redoximorphic depletions; many fine prominent olive (5Y 5/6) and few medium prominent red (2.5YR 4/8) redoximorphic concentrations; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 18 to 44 inches
Thickness of the mollic epipedon: 12 to 24 inches
Depth to till: 20 to 40 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam or silty clay
Reaction—moderately acid to neutral

Bw horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—2 or 3
Texture—silty clay loam, silty clay, or clay
Reaction—moderately acid to neutral

2Bw horizon:
Hue—2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—loam or clay loam
Reaction—slightly acid or neutral

2C horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—2 to 4
Texture—loam or clay loam
Reaction—slightly alkaline or moderately alkaline

Hanlon Series

Typical Pedon

Hanlon fine sandy loam, 0 to 2 percent slopes, occasionally flooded, 250 feet north and 450 feet west of the southeast corner of sec. 31, T. 92 N., R. 28 W.; in Humboldt County, Iowa; USGS Humboldt, Iowa, topographic quadrangle; lat. 42 degrees 43 minutes 58 seconds N. and long. 94 degrees 11 minutes 23 seconds W., NAD 27:

Ap—0 to 8 inches; black (10YR 2/1) fine sandy loam, very dark gray (10YR 3/1) dry; weak fine granular structure; very friable; common fine roots; slightly acid; clear smooth boundary.

A1—8 to 17 inches; black (10YR 2/1) and very dark brown (10YR 2/2) fine sandy loam, very dark grayish brown (10YR 3/2) dry; weak very fine and medium subangular blocky structure; very friable; common medium roots; moderately acid; clear smooth boundary.

A2—17 to 28 inches; very dark brown (10YR 2/2) fine sandy loam, very dark grayish brown (10YR 3/2) dry; weak fine and medium subangular blocky structure; very friable; common medium roots; slightly acid; gradual smooth boundary.

A3—28 to 41 inches; very dark brown (10YR 2/2) fine sandy loam, very dark grayish brown (10YR 3/2) dry; weak fine and medium subangular blocky

structure; very friable; common very fine and fine roots; slightly acid; gradual smooth boundary.
A4—41 to 49 inches; very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots; neutral; gradual smooth boundary.
Bw1—49 to 60 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots; neutral; gradual smooth boundary.
Bw2—60 to 71 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; common very fine and fine roots; neutral; gradual smooth boundary.
C—71 to 80 inches; dark brown (10YR 3/3) sandy loam; massive; very friable; common very fine and fine roots; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 40 to 71 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam
Reaction—neutral to moderately acid

Bw horizon:
Hue—10YR
Value—3 or 4
Chroma—1 or 2
Texture—sandy loam or fine sandy loam
Reaction—neutral or slightly acid

C horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—2 to 4
Texture—sandy loam
Reaction—neutral or slightly acid

Harps Series

Typical Pedon

Harps loam, 0 to 2 percent slopes, in a cultivated field; 200 feet north and 50 feet west of the southeast corner of sec. 7, T. 97 N., R. 35 W., Lake Township; USGS Dickens, Iowa, topographic quadrangle; lat. 42 degrees 13 minutes 55 seconds N. and long. 95 degrees 01 minute 00 seconds W., NAD 27:

Ap—0 to 7 inches; black (10YR 2/1) loam, gray (10YR 5/1) dry; weak fine granular structure; friable; common very fine roots; violently effervescent; moderately alkaline; gradual smooth boundary.
Ak—7 to 18 inches; black (10YR 2/1) loam, gray (10YR 5/1) dry; weak fine and medium granular structure; friable; common very fine roots; violently effervescent; moderately alkaline; gradual wavy boundary.
ABk—18 to 22 inches; very dark gray (2.5Y 3/1) clay loam, gray (10YR 6/1) dry; weak fine and medium granular structure; friable; common very fine roots; about 2 percent gravel; common fine and medium faint dark grayish brown (2.5Y 4/2) and common fine and medium distinct dark gray (5Y 4/1) redoximorphic depletions; violently effervescent; moderately alkaline; gradual wavy boundary.
Bkg1—22 to 41 inches; gray (5Y 5/1) clay loam; weak fine subangular blocky structure; friable; common very fine roots; few black (10YR 2/1) organic coatings in root channels and/or pores; few fine light gray (10YR 7/2) calcium carbonate nodules; about 3 percent gravel; common fine and medium faint olive gray (5Y 5/2) redoximorphic depletions; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; violently effervescent; moderately alkaline; gradual wavy boundary.
Bkg2—41 to 51 inches; gray (5Y 5/1) clay loam; weak fine and medium subangular blocky structure; friable; common fine and medium very pale brown (10YR 8/2) calcium carbonate nodules and few fine very pale brown (10YR 8/2) calcium carbonate concretions; about 3 percent gravel; common fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; common fine and medium faint olive gray (5Y 5/2) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual wavy boundary.
Cg—51 to 80 inches; gray (5Y 5/1) loam; massive; friable; about 3 percent gravel; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; common fine and medium faint olive gray (5Y 5/2) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 12 to 24 inches

Ap or Ak horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1

Texture—loam
Reaction—moderately alkaline

ABk horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 or 4
Chroma—0 or 1
Texture—loam or clay loam
Reaction—moderately alkaline

Bkg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—loam or clay loam
Reaction—moderately alkaline

Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—loam or clay loam with thin strata of coarser material
Reaction—moderately alkaline

Havelock Series

Typical Pedon

Havelock clay loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; 520 feet west and 110 feet south of the northeast corner of sec. 4, T. 96 N., R. 36 W., Sioux Township; USGS Dickens, Iowa, topographic quadrangle; lat. 43 degrees 10 minutes 07 seconds N. and long. 95 degrees 05 minutes 35 seconds W., NAD 27:

Ap—0 to 7 inches; black (N 2/0) clay loam, very dark gray (N 3/0) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; few fine fragments of snail shells; slightly effervescent; slightly alkaline; abrupt smooth boundary.

A1—7 to 16 inches; black (N 2/0) clay loam, very dark gray (N 3/0) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; slightly effervescent; slightly alkaline; gradual smooth boundary.

A2—16 to 26 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; friable; strongly effervescent; moderately alkaline; gradual smooth boundary.

A3—26 to 34 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; moderate medium and fine subangular blocky structure; friable; strongly effervescent; moderately alkaline; gradual smooth boundary.

A4—34 to 46 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; friable; common fine black (N 2/0) manganese concretions; few fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; clear smooth boundary.

Cg1—46 to 58 inches; dark gray (2.5Y 4/1) loam; massive; friable; many fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; clear smooth boundary.

Cg2—58 to 68 inches; dark gray (2.5Y 4/1) loam; massive; friable; few fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; abrupt wavy boundary.

Cg3—68 to 80 inches; dark gray (2.5Y 4/1) loam; massive; firm; common distinct black (10YR 2/1) organic coatings; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 36 inches or more
Other features: Some pedons have an AC horizon or a Bg horizon.

Ap or A horizon:
Hue—10YR, 5Y, or N
Value—2 to 4
Chroma—0 or 1
Texture—clay loam
Reaction—slightly alkaline or moderately alkaline

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—loam or clay loam; strata of coarser textures in some pedons
Reaction—neutral to moderately alkaline

Hawick Series

Taxadjunct features: The Hawick soil in map unit 541C does not have a mollic epipedon. This soil is classified as a mixed, mesic Typic Udipsamment.

Typical Pedon

Hawick gravelly loamy sand, 9 to 14 percent slopes, in a cultivated field; 2,600 feet east and 550 feet north of the southwest corner of sec. 23, T. 96 N., R. 35 W., Freeman Township; USGS Silver Lake, Iowa, topographic quadrangle; lat. 43 degrees 06 minutes 50 seconds N. and long. 94 degrees 56 minutes 37 seconds W., NAD 27:

Ap—0 to 8 inches; very dark brown (10YR 2/2) gravelly loamy sand, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; very friable; common very fine to medium roots; about 22 percent gravel; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bw—8 to 27 inches; dark yellowish brown (10YR 4/4) gravelly loamy sand; very weak fine subangular blocky structure; very friable; common very fine and fine roots; about 19 percent gravel; slightly effervescent; slightly alkaline; gradual wavy boundary.

C1—27 to 46 inches; yellowish brown (10YR 5/4) gravelly sand; single grain; loose; common very fine roots; about 20 percent gravel; strongly effervescent; slightly alkaline; gradual wavy boundary.

C2—46 to 80 inches; yellowish brown (10YR 5/4) gravelly sand; single grain; loose; about 20 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 30 inches
Thickness of the mollic epipedon: 7 to 16 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—gravelly loamy sand
Reaction—slightly acid to slightly alkaline

Bw horizon:
Hue—10YR
Value—3 to 5
Chroma—2 to 4
Texture—gravelly loamy sand, gravelly loamy coarse sand, or gravelly coarse sand
Reaction—slightly acid to slightly alkaline

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—gravelly loamy sand, gravelly coarse sand, or gravelly sand
Reaction—slightly alkaline or moderately alkaline

Klossner Series

Typical Pedon

Klossner muck, depressional, 0 to 1 percent slopes, in a cultivated field; 1,400 feet north and 2,250 feet west of the southeast corner of sec. 11, T. 97 N., R. 35 W., Lake Township; USGS Ruthven, Iowa, topographic quadrangle; lat. 43 degrees 14 minutes 07 seconds N. and long. 94 degrees 56 minutes 40 seconds W., NAD 27:

Oap—0 to 9 inches; black (N 2/0) muck, black (10YR 2/1) dry; weak medium granular structure; very friable; common very fine to medium roots; neutral; clear smooth boundary.

Oa1—9 to 12 inches; black (5YR 2.5/1) muck, very dark gray (2.5Y 3/1) dry; weak medium granular and weak medium platy structure; very friable; common very fine to medium roots; neutral; clear smooth boundary.

Oa2—12 to 18 inches; black (5YR 2.5/1) muck, very dark gray (2.5Y 3/1) dry; weak medium granular structure; very friable; common very fine and fine roots; noneffervescent; slightly alkaline; clear smooth boundary.

Oa3—18 to 22 inches; black (5YR 2.5/1) muck, very dark gray (2.5Y 3/1) dry; weak fine granular structure; very friable; common very fine and fine roots; noneffervescent; slightly alkaline; clear smooth boundary.

2A1—22 to 31 inches; black (10YR 2/1) mucky silty clay loam; moderate medium subangular blocky and angular blocky structure; friable; common very fine roots; few yellowish red (5YR 4/6) redoximorphic concentrations in pores and root channels; slightly effervescent; slightly alkaline; clear smooth boundary.

2A2—31 to 53 inches; black (5Y 2/1) silty clay loam; some mixing of olive gray (5Y 5/2) in the lower part; moderate medium subangular blocky structure; friable; common very fine roots; strongly effervescent; slightly alkaline; clear smooth boundary.

2Cg1—53 to 70 inches; mixed olive gray (5Y 5/2) and light olive gray (5Y 6/2) silty clay loam; massive; friable; few very fine and fine roots; common fine prominent yellowish red (5YR 4/6) iron oxide coatings in root channels; strongly effervescent; slightly alkaline; clear smooth boundary.

2Cg2—70 to 80 inches; gray (5Y 5/1) silty clay loam; massive; friable; few very fine roots; few fine prominent yellowish red (5YR 4/6) iron oxide coatings in root channels; common fine white (10YR 8/1) calcium carbonate nodules; common fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline.

Range in Characteristics

Oap and Oa horizons:
Hue—10YR, 5YR, or N
Value—2, 2.5, or 3
Chroma—0 to 2
Texture—muck
Reaction—moderately acid to slightly alkaline

2A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—2 or 3
Chroma—0 or 1
Texture—loam, silt loam, silty clay loam, or clay loam or the mucky analogs of these textures
Reaction—moderately acid to slightly alkaline

2Cg horizon:
Hue—10YR, 2.5Y, 5Y, 5GY, or N
Value—2 to 7
Chroma—0 to 2
Texture—loam, clay loam, silt loam, silty clay loam, or sandy loam or the gravelly analogs of these textures
Reaction—slightly acid to moderately alkaline

Knoke Series

Typical Pedon

Knoke mucky silty clay loam, depressional, 0 to 1 percent slopes, in a cultivated field; 1,200 feet south and 600 feet east of the northwest corner of sec. 25, T. 102 N., R. 39 W.

Ap—0 to 10 inches; black (10YR 2/1) mucky silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; very friable; few snail-shell fragments; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A1—10 to 22 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; friable; few snail-shell fragments; strongly effervescent; moderately alkaline; gradual smooth boundary.

A2—22 to 36 inches; black (10YR 2/1) silty clay loam, very dark gray (2.5Y 3/1) dry; weak medium subangular blocky structure; friable; strongly effervescent; moderately alkaline; gradual smooth boundary.

A3—36 to 42 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; friable; strongly effervescent; moderately alkaline; clear smooth boundary.

Cg1—42 to 65 inches; very dark gray (5Y 3/1) and dark olive gray (5Y 3/2) silty clay loam; massive; friable; common fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cg2—65 to 80 inches; dark gray (5Y 4/1) and dark olive gray (5Y 3/2) silty clay loam; massive; friable; few snail-shell fragments; slightly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 48 inches

Ap or A horizon:
Hue—10YR, 2.5Y, or N
Value—2
Chroma—0 or 1
Texture—silty clay loam or mucky silty clay loam
Reaction—slightly alkaline or moderately alkaline

Bw horizon (if it occurs):
Hue—10YR, 2.5Y, 5Y, or N
Value—2 to 5
Chroma—0 or 1
Texture—silty clay loam, clay loam, or silty clay
Reaction—slightly alkaline or moderately alkaline

BCg horizon (if it occurs):
Hue—2.5Y, 5Y, or N
Value—2 to 5
Chroma—0 or 1
Texture—silty clay loam, clay loam, or silty clay
Reaction—slightly alkaline or moderately alkaline

Cg horizon:
Hue—2.5Y, 5Y, or 5G
Value—3 to 6
Chroma—1 or 2
Texture—silty clay loam, silt loam, clay loam, or loam
Reaction—slightly alkaline or moderately alkaline

Letri Series

Typical Pedon

Letri clay loam, 0 to 2 percent slopes, in a cultivated field; 390 feet east and 1,500 feet north of the southwest corner of sec. 23, T. 97 N., R. 38 W., Waterford Township; USGS Everly, Iowa, topographic quadrangle; lat. 43 degrees 12 minutes 09 seconds N.

and long. 95 degrees 18 minutes 26 seconds W., NAD 27:

Ap—0 to 9 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; common very fine and fine roots; many distinct black (N 2/0) organic coatings on faces of peds; noneffervescent; slightly alkaline; abrupt smooth boundary.

A1—9 to 16 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; weak medium granular structure; friable; common very fine and fine roots; neutral; clear smooth boundary.

A2—16 to 20 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; friable; common very fine and fine roots; many distinct dark olive gray (5Y 3/2) organic coatings on faces of peds; common fine prominent olive gray (5Y 4/2) redoximorphic depletions; slightly effervescent; slightly alkaline; clear smooth boundary.

Bg—20 to 26 inches; olive gray (5Y 4/2) clay loam; weak fine subangular blocky structure; friable; common distinct dark olive gray (5Y 3/2) and black (10YR 2/1) organic coatings on faces of peds; common fine prominent light olive brown (2.5Y 5/4) redoximorphic concentrations; slightly effervescent; slightly alkaline; abrupt wavy boundary.

2Bkg1—26 to 31 inches; olive gray (5Y 5/2) clay loam; weak fine and medium subangular blocky structure; friable; common fine and medium very pale brown (10YR 8/2) calcium carbonate threads; about 8 percent gravel; common fine prominent light olive brown (2.5Y 5/4) redoximorphic concentrations; strongly effervescent; moderately alkaline; clear wavy boundary.

2Bkg2—31 to 41 inches; grayish brown (2.5Y 5/2) clay loam; weak medium subangular blocky structure; firm; common fine and medium very pale brown (10YR 8/3) calcium carbonate threads; about 8 percent gravel; common fine prominent strong brown (7.5YR 5/6) and many fine and medium prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; clear smooth boundary.

2C—41 to 80 inches; light olive brown (2.5Y 5/4) clay loam; massive; firm; about 3 percent gravel; many fine and medium distinct grayish brown (2.5Y 5/2) redoximorphic depletions; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 16 to 30 inches
Thickness of the mollic epipedon: 14 to 24 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—2 or 3
Chroma—0 or 1
Texture—clay loam
Reaction—slightly acid to slightly alkaline

Bg or 2Bkg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—clay loam or silty clay loam
Reaction—neutral to moderately alkaline

2C horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—clay loam or loam
Reaction—slightly alkaline or moderately alkaline

May City Series

Taxadjunct features: The May City soil in map unit 672C2 does not have a mollic epipedon. This soil is classified as a loamy-skeletal, mixed, superactive, mesic Typic Eutrudept.

Typical Pedon

May City sandy clay loam, 2 to 5 percent slopes, in a cultivated field; 200 feet east and 1,820 feet south of the center of sec. 22, T. 97 N., R. 38 W., Waterford Township; USGS Everly, Iowa, topographic quadrangle; lat. 43 degrees 12 minutes 04 seconds N. and long. 95 degrees 19 minutes 06 seconds W., NAD 27:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) sandy clay loam, very dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; about 11 percent gravel (most pebbles less than 1 inch in diameter); about 3 percent fine fragments of shale; moderately acid; abrupt wavy boundary.

Bw1—7 to 12 inches; dark yellowish brown (10YR 4/4) sandy clay loam with streaks and pockets of very dark grayish brown (10YR 3/2); moderate medium and fine subangular blocky structure parting to moderate fine granular; friable; about 9 percent gravel (some pebbles more than 3 inches in diameter); about 2 percent fine fragments of shale; moderately acid; clear wavy boundary.

Bw2—12 to 19 inches; dark brown (7.5YR 4/4) gravelly sandy loam; weak fine and medium subangular blocky structure; very friable; about 25 percent gravel; about 2 percent fine fragments of shale; slightly acid; abrupt wavy boundary.

C1—19 to 36 inches; strong brown (7.5YR 4/6) extremely gravelly sandy loam; massive; very friable; about 67 percent gravel and 10 percent cobbles; about 2 percent fine fragments of shale; strongly effervescent; slightly alkaline; abrupt wavy boundary.

C2—36 to 42 inches; strong brown (7.5YR 5/8) extremely gravelly sandy loam; massive; very friable; few white (10YR 8/1) calcium carbonate coatings on rock fragments; about 57 percent gravel, 3 percent cobbles, and 2 percent shale fragments; strongly effervescent; moderately alkaline; abrupt wavy boundary.

C3—42 to 53 inches; dominantly yellowish red (5YR 5/6) very gravelly sandy loam; about 20 percent red (2.5YR 4/6) very gravelly sandy loam; massive; very friable; about 54 percent gravel, 3 percent cobbles, and 2 percent shale fragments; strongly effervescent; moderately alkaline; abrupt wavy boundary.

C4—53 to 67 inches; mixed strong brown (7.5YR 4/6) and yellowish red (5YR 5/6) extremely gravelly sandy loam; massive; very friable; few white (10YR 8/1) calcium carbonate coatings on rock fragments; about 63 percent gravel and 2 percent fine fragments of shale; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C5—67 to 80 inches; mixed yellowish red (5YR 4/6) and red (2.5YR 4/6) extremely gravelly sandy loam; massive; very friable; about 60 percent gravel, 15 percent cobbles, and 2 percent fine fragments of shale; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 14 inches
Depth to carbonates: 0 to 28 inches
Depth to coarse textured material: 10 to 24 inches
Other features: Some pedons have thin layers of silty to very fine sand sediments between the gravel layers.

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy clay loam
Reaction—moderately acid to slightly alkaline

Bw horizon:
Hue—10YR, 7.5YR, or 5YR
Value—3 to 5
Chroma—3 to 6
Texture—loam, sandy loam, or sandy clay loam or the gravelly to extremely gravelly analogs of these textures
Reaction—moderately acid to slightly alkaline

C horizon:
Hue—10YR, 7.5YR, 5YR, or 2.5YR
Value—4 to 6
Chroma—4 to 8
Texture—the gravelly to extremely gravelly analogs of sandy loam, sandy clay loam, or loam
Reaction—slightly alkaline or moderately alkaline

McCreath Series

Typical Pedon

McCreath silty clay loam, 0 to 2 percent slopes, in a cultivated field; 30 feet north and 1,250 feet west of the southeast corner of sec. 18, T. 94 N., R. 38 W., Peterson Township; USGS Peterson, Iowa, topographic quadrangle; lat. 42 degrees 57 minutes 14 seconds N. and long. 95 degrees 15 minutes 16 seconds W., NAD 27:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine and medium granular structure; friable; common very fine and fine roots; neutral; clear smooth boundary.

A1—8 to 13 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak medium granular structure; friable; common very fine and fine roots; slightly acid; clear smooth boundary.

A2—13 to 17 inches; very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; common very fine and fine roots; common fine and medium dark grayish brown (10YR 4/2) wormcasts; slightly acid; clear wavy boundary.

AB—17 to 22 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine and medium granular structure; friable; common very fine roots; few distinct very dark brown (10YR 2/2) organic coatings on faces of peds; slightly acid; gradual wavy boundary.

Bg—22 to 33 inches; dark grayish brown (2.5Y 4/2) silty clay loam; weak fine subangular blocky structure; friable; common very fine roots; very few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common fine very dark brown (10YR 2/2) rounded iron-manganese nodules; neutral; gradual wavy boundary.

Bkg—33 to 47 inches; grayish brown (2.5Y 5/2) silt loam; weak medium subangular blocky structure; friable; common very fine roots; common fine very dark brown (10YR 2/2) rounded iron-manganese nodules; few fine and medium light gray (2.5Y 7/2) calcium carbonate nodules; common fine and medium prominent light olive brown (2.5Y 5/6) and common fine and medium distinct light olive brown (2.5Y 5/4) redoximorphic concentrations; very slightly effervescent; slightly alkaline; gradual wavy boundary.

2C—47 to 80 inches; yellowish brown (10YR 5/4) clay loam; massive; firm; few very fine roots; few fine and medium black (10YR 2/1) rounded iron-manganese concretions; common medium and coarse light gray (2.5Y 7/2) calcium carbonate nodules; about 4 percent gravel; many fine and medium distinct yellowish brown (10YR 5/6) redoximorphic concentrations; common fine distinct gray (10YR 6/1) redoximorphic depletions; slightly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 24 inches
Depth to carbonates: 24 to 50 inches
Depth to till: 40 to 60 inches

A horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 to 2
Texture—silty clay loam
Reaction—moderately acid to neutral

Bg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 or 3
Texture—silty clay loam
Reaction—slightly acid to slightly alkaline

Bkg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silty clay loam or silt loam
Reaction—slightly alkaline or moderately alkaline

2C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—loam or clay loam
Reaction—slightly alkaline or moderately alkaline

Moneta Series

Typical Pedon

Moneta clay loam, 18 to 25 percent slopes, in a pasture; 2,350 feet north and 400 feet east of the southwest corner of sec. 20, T. 94 N., R. 36 W., Herdland Township; USGS Sioux Rapids, Iowa, topographic quadrangle; lat. 42 degrees 56 minutes 33 seconds N. and long. 95 degrees 07 minutes 51 seconds W., NAD 27:

A—0 to 9 inches; very dark brown (10YR 2/2) clay loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; common very fine and fine roots between peds; about 2 percent gravel; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—9 to 13 inches; yellowish brown (10YR 5/6) loam; weak fine and medium granular structure; friable; common very fine and fine roots; few prominent very dark brown (10YR 2/2) organic coatings on faces of peds; about 3 percent gravel; about 2 percent fine fragments of shale; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk1—13 to 23 inches; yellowish brown (10YR 5/6) loam; weak fine and medium subangular blocky structure; friable; common very fine and fine roots between peds; carbonates disseminated throughout; about 3 percent gravel; about 2 percent fine fragments of shale; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—23 to 42 inches; yellowish brown (10YR 5/6) loam; weak fine and medium subangular blocky structure; friable; common very fine and fine roots between peds; very few distinct strong brown (7.5YR 5/6) iron oxide coatings on faces of peds and in pores; common fine and medium very pale brown (10YR 8/2) calcium carbonate nodules; about 3 percent gravel; about 2 percent fine fragments of shale; common fine and medium prominent gray (10YR 5/1) redoximorphic depletions; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—42 to 53 inches; about 50 percent strong brown (7.5YR 5/6) and 50 percent gray (10YR 5/1) loam; moderate fine and medium angular blocky structure; friable; common very fine and fine roots between peds; very few prominent black (10YR 2/1) organic coatings on faces of peds; common fine and medium very pale brown (10YR 8/2) calcium carbonate nodules and calcium carbonate coatings around stones; common fine and medium red (2.5YR 4/6) masses of iron; about 3 percent gravel; about 2 percent fine fragments of shale; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk4—53 to 60 inches; about 50 percent strong brown (7.5YR 5/6) and 50 percent gray (10YR 5/1) loam; moderate medium and coarse angular blocky structure; friable; common very fine and fine roots between peds; very few prominent black (10YR 2/1) organic coatings on faces of peds; common medium and coarse very pale brown (10YR 8/2) calcium carbonate nodules; common fine and medium red (2.5YR 4/6) masses of iron; about 5 percent gravel; about 3 percent fine fragments of shale; violently effervescent; moderately alkaline; gradual wavy boundary.

BC—60 to 80 inches; about 50 percent strong brown (7.5YR 5/6) and 50 percent gray (10YR 5/1) loam; moderate coarse and very coarse prismatic structure; firm; common very fine and fine roots; common medium and coarse very pale brown (10YR 8/2) calcium carbonate nodules; common fine and medium red (2.5YR 4/6) masses of iron; about 5 percent gravel; about 3 percent fine fragments of shale; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 6 to 12 inches
Depth to carbonates: 0 to 10 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—2 or 3
Texture—clay loam or loam
Reaction—slightly alkaline or moderately alkaline

Bw and Bk horizons:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—1 to 8
Texture—loam or clay loam
Reaction—slightly alkaline or moderately alkaline

BC or C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—1 to 8
Texture—loam or clay loam
Reaction—slightly alkaline or moderately alkaline

Nicollet Series

Typical Pedon

Nicollet loam, 1 to 3 percent slopes, in a cultivated field; 210 feet north and 540 feet east of the center of sec. 26, T. 94 N., R. 35 W., Herdland Township; USGS Webb, Iowa, topographic quadrangle; lat. 42 degrees 55 minutes 57 seconds N. and long. 95 degrees 03 minutes 40 seconds W., NAD 27:

Ap—0 to 8 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common fine roots; about 2 percent gravel; slightly acid; abrupt smooth boundary.

AB—8 to 16 inches; black (10YR 2/1) loam; some mixing of very dark grayish brown (10YR 3/2) in the lower part; dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; common fine roots; about 2 percent gravel; slightly acid; gradual smooth boundary.

Bg1—16 to 22 inches; dark grayish brown (10YR 4/2) loam; weak fine subangular blocky structure; friable; few fine roots; common distinct very dark gray (10YR 3/1) organic coatings on faces of peds; about 2 percent gravel; neutral; clear smooth boundary.

Bg2—22 to 31 inches; dark grayish brown (2.5Y 4/2) loam; weak fine subangular blocky structure; friable; few fine roots; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; about 3 percent gravel; few fine distinct light olive brown (2.5Y 5/4) redoximorphic concentrations; slightly effervescent; slightly alkaline; abrupt wavy boundary.

Bkg—31 to 43 inches; grayish brown (2.5Y 5/2) loam; weak fine and medium subangular blocky structure; friable; few fine white (10YR 8/1) calcium carbonate nodules; about 3 percent gravel; many fine distinct light olive brown (2.5Y 5/4) and few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; clear smooth boundary.

Cg1—43 to 55 inches; grayish brown (2.5Y 5/2) loam; massive; friable; few fine white (10YR 8/1) calcium carbonate nodules; about 3 percent gravel; many medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cg2—55 to 80 inches; grayish brown (2.5Y 5/2) loam; massive; friable; common fine white (10YR 8/1) calcium carbonate nodules; about 5 percent gravel; many medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 20 to 48 inches
Thickness of the mollic epipedon: 10 to 24 inches

Ap and AB horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam
Reaction—moderately acid to neutral

Bg and Bkg horizons:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—loam or clay loam
Reaction—slightly acid to slightly alkaline

Cg horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—2 to 4
Texture—loam
Reaction—slightly alkaline or moderately alkaline

Ocheda Series

Typical Pedon

Ocheda silty clay loam, 1 to 3 percent slopes, in a cultivated field; about 75 feet south and 138 feet east of the northwest corner of sec. 25, T. 97 N., R. 35 W.; USGS Ruthven, Iowa, topographic quadrangle; lat. 43 degrees 14 minutes 38 seconds N. and long. 94 degrees 56 minutes 06 seconds W., NAD 27:

Ap—0 to 6 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; firm; common very fine and fine roots; few very fine tubular pores; slightly acid; abrupt smooth boundary.

A—6 to 12 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate very fine subangular blocky structure; firm; few very fine and fine roots; few very fine tubular pores; slightly acid; clear smooth boundary.

AB—12 to 19 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark gray (10YR 4/1) dry; moderate very fine and fine subangular blocky structure; firm; few very fine and fine roots; few very fine tubular pores; many distinct very dark gray (10YR 3/1) organic coatings on faces of peds; slightly acid; clear wavy boundary.

Bg1—19 to 27 inches; dark grayish brown (2.5Y 4/2) silty clay; moderate very fine and fine subangular blocky structure; firm; few very fine and fine roots; few very fine tubular pores; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common fine distinct olive brown (2.5Y 4/4) redoximorphic concentrations; slightly acid; gradual smooth boundary.

Bg2—27 to 38 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate very fine prismatic structure parting to moderate fine subangular blocky; firm; few very fine and fine roots; few very fine tubular pores; common distinct dark grayish brown (2.5Y 4/2) organic coatings on faces of peds; common fine distinct light olive brown (2.5Y 5/4) redoximorphic concentrations; slightly acid; clear wavy boundary.

Bkg—38 to 50 inches; grayish brown (2.5Y 5/2) silty clay loam; weak fine prismatic structure parting to weak medium subangular blocky; friable; few very fine and fine roots; few very fine tubular pores; common fine rounded very pale brown (10YR 8/2) masses and concretions of calcium carbonate; about 5 percent mixed gravel; common medium and coarse prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; clear smooth boundary.

2Cg—50 to 80 inches; light olive brown (2.5Y 5/4) and grayish brown (2.5Y 5/2) loam; massive; friable; very few fine tubular pores; common very fine and fine very pale brown (10YR 8/2) masses of calcium carbonate; about 2 percent mixed gravel; common fine and medium distinct light olive brown (2.5Y 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 12 to 24 inches
Depth to free carbonates: 18 to 44 inches
Depth to till: 40 to 60 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam or silty clay
Reaction—moderately acid to neutral

Bw or Bg horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 or 3

Texture—silty clay loam, silty clay, or clay
Reaction—moderately acid to neutral

Bk or Bkg horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 or 3
Texture—silty clay loam or silty clay
Reaction—slightly alkaline or moderately alkaline

2Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—2 to 4
Texture—loam or clay loam
Reaction—slightly alkaline or moderately alkaline

Ocheyedan Series

Taxadjunct features: The Ocheyedan soil in map unit 379C2 does not have a mollic epipedon. This soil is classified as a fine-loamy, mixed, superactive, mesic Typic Eutrudept.

Typical Pedon

Ocheyedan loam, 2 to 5 percent slopes, in a cultivated field; 960 feet north and 710 feet east of the southwest corner of sec. 28, T. 97 N., R. 38 W.; USGS Everly, Iowa, topographic quadrangle; lat. 43 degrees 11 minutes 12 seconds N. and long. 95 degrees 20 minutes 42 seconds W., NAD 27:

Ap—0 to 7 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; slightly acid; clear smooth boundary.

A—7 to 14 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine and medium granular structure; friable; few brown (10YR 4/3) earthworm casts; slightly acid; gradual smooth boundary.

Bw1—14 to 21 inches; brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; few black (10YR 2/1) earthworm casts; neutral; gradual smooth boundary.

Bw2—21 to 26 inches; brown (10YR 4/3) sandy clay loam; weak fine subangular blocky structure; friable; few black (10YR 2/1) earthworm casts; neutral; gradual smooth boundary.

Bw3—26 to 34 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; many pores about $^{1}/_{16}$ inch in diameter; neutral; gradual smooth boundary.

2BC—34 to 44 inches; mixed dark yellowish brown (10YR 4/4) and grayish brown (2.5Y 5/2) silt loam; weak medium subangular blocky structure; friable; common fine distinct light olive brown (2.5Y 5/6) redoximorphic concentrations; noneffervescent; slightly alkaline; gradual smooth boundary.

2Cg—44 to 65 inches; grayish brown (2.5Y 5/2) silt loam; massive; friable; common fine and medium very pale brown (10YR 8/2) masses of calcium carbonate; common medium prominent strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; abrupt smooth boundary.

3C—65 to 80 inches; yellowish brown (10YR 5/4 and 5/6) clay loam; massive; firm; common fine and medium very pale brown (10YR 8/2) masses of calcium carbonate; about 3 percent gravel; common medium distinct grayish brown (2.5Y 5/2) redoximorphic depletions; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to 55 inches
Thickness of the mollic epipedon: 12 to 20 inches
Other features: A lacustrine substratum phase is recognized. The lacustrine material is below a depth of 60 inches. It has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 to 4. The texture is silt loam, silty clay loam, silty clay, or clay. Reaction is slightly alkaline or moderately alkaline.

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam
Reaction—moderately acid to neutral

Bw horizon:
Hue—10YR
Value—4
Chroma—3 or 4
Texture—loam, fine sandy loam, or sandy clay loam
Reaction—slightly acid or neutral

2BC and 2Cg horizons:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 to 6
Texture—sandy loam, silt loam, or sandy clay loam
Reaction—slightly alkaline or moderately alkaline

3C horizon:
Hue—10YR or 2.5Y
Value—4 to 6

Chroma—2 to 6
Texture—clay loam or loam
Reaction—slightly alkaline or moderately alkaline

Okoboji Series

Typical Pedon

Okoboji silty clay loam, depressional, 0 to 1 percent slopes, in a cultivated field; 2,500 feet south and 550 feet west of the northeast corner of sec. 12, T. 97 N., R. 35 W., Lake Township; USGS Ruthven, Iowa, topographic quadrangle; lat. 43 degrees 14 minutes 06 seconds N. and long. 94 degrees 54 minutes 57 seconds W., NAD 27:

Ap—0 to 8 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; weak fine granular structure; friable; common very fine and fine roots; slightly alkaline; clear smooth boundary.

A1—8 to 18 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; moderate fine and medium granular structure; friable; common very fine and fine roots; slightly alkaline; clear smooth boundary.

A2—18 to 40 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine and medium subangular blocky structure; friable; common very fine roots; neutral; clear smooth boundary.

AB—40 to 45 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; common very fine roots; very few reddish brown (5YR 4/4) iron oxide coatings on faces of peds; common medium prominent olive gray (5Y 5/2) redoximorphic depletions; neutral; gradual wavy boundary.

Bg1—45 to 55 inches; dark gray (5Y 4/1) silty clay loam; weak fine subangular blocky structure; friable; common very fine roots; very few distinct black (10YR 2/1) organic coatings on faces of peds; few medium black (10YR 2/1) rounded iron-manganese concretions; common medium faint olive gray (5Y 5/2) redoximorphic depletions; neutral; gradual wavy boundary.

Bg2—55 to 65 inches; olive gray (5Y 5/2) silty clay loam; weak fine subangular blocky structure; friable; very few distinct black (10YR 2/1) organic coatings on faces of peds; few yellowish red (5YR 4/6) iron oxide coatings on faces of peds; few medium black (10YR 2/1) rounded iron-manganese concretions; common medium faint gray (5Y 5/1) redoximorphic depletions; slightly alkaline; clear smooth boundary.

Cg—65 to 80 inches; olive gray (5Y 5/2) silty clay loam; massive; friable; few yellowish red (5YR 4/6) iron oxides; few medium black (10YR 2/1) rounded iron-manganese concretions; common medium faint gray (5Y 5/1) redoximorphic depletions; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to 56 inches
Thickness of the mollic epipedon: 24 to 48 inches

Ap, A, and AB horizons:
Hue—10YR, 5Y, or N
Value—2
Chroma—0 or 1
Texture—silty clay loam or mucky silty clay loam
Reaction—slightly acid to slightly alkaline

Bg horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 to 5
Chroma—0 to 2
Texture—silty clay loam or silty clay
Reaction—neutral or slightly alkaline

Cg horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam that has thin strata of silt loam
Reaction—slightly alkaline or moderately alkaline

Omsrud Series

Taxadjunct features: The Omsrud soils in this survey area do not have a mollic epipedon. They are classified as fine-loamy, mixed, superactive, mesic Typic Eutrudepts.

Typical Pedon

Omsrud loam, in an area of Storden-Omsrud complex, 9 to 14 percent slopes, moderately eroded, in a cultivated field; 780 feet south and 300 feet west of the northeast corner of sec. 3, T. 96 N., R. 36 W., Sioux Township; USGS Dickens, Iowa, topographic quadrangle; lat. 43 degrees 09 minutes 53 seconds N. and long. 97 degrees 04 minutes 56 seconds W., NAD 27:

Ap—0 to 9 inches; dark brown (10YR 2/2) loam; mixed with streaks and pockets of dark yellowish brown (10YR 4/4) material from the subsoil; very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; friable; common very fine and fine roots; about 2 percent gravel; neutral; abrupt smooth boundary.

Bw1—9 to 20 inches; dark yellowish brown (10YR 4/4) loam; weak fine and medium subangular blocky structure; friable; common very fine and fine roots; about 3 percent gravel; neutral; clear smooth boundary.

Bw2—20 to 32 inches; brown (10YR 4/3) loam; weak medium subangular blocky structure; friable; common very fine and fine roots; about 2 percent gravel; neutral; abrupt wavy boundary.

Bk—32 to 45 inches; yellowish brown (10YR 5/4) loam; weak very fine prismatic structure parting to weak medium subangular blocky; friable; common very fine and fine roots; few very fine black (10YR 2/1) iron-manganese oxide coatings on faces of prisms; few fine prominent yellowish red (5YR 4/6) iron concretions; common white (10YR 8/1) masses of calcium carbonate; about 3 to 5 percent gravel; slightly effervescent; moderately alkaline; clear smooth boundary.

C1—45 to 63 inches; yellowish brown (10YR 5/4) loam; massive; friable; few fine black (10YR 2/1) iron-manganese oxide coatings on faces of joints; few fine prominent red (2.5YR 4/6) iron concretions; common white (10YR 8/1) masses of calcium carbonate; about 3 to 5 percent gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—63 to 80 inches; yellowish brown (10YR 5/4) loam; massive; friable; few fine black (10YR 2/1) iron-manganese oxide coatings on faces of joints; common very pale brown (10YR 8/2) threads and masses of calcium carbonate; about 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 18 to 50 inches
Thickness of the mollic epipedon: 7 to 20 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam
Reaction—moderately acid to neutral

Bw and Bk horizons:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—loam
Reaction—moderately acid to neutral in the Bw horizon; slightly alkaline or moderately alkaline in the Bk horizon

C horizon:
Hue—10YR
Value—4 or 5
Chroma—2 to 4
Texture—loam or sandy loam
Reaction—slightly alkaline or moderately alkaline

Primghar Series

Typical Pedon

Primghar silty clay loam, 0 to 2 percent slopes, in a cultivated field; about 4 1/2 miles north and 2 miles west of Marcus, in Cherokee County, Iowa; about 880 feet south and 410 feet west of the northeast corner of sec. 7, T. 93 N., R. 42 W.; USGS Granville East topographic quadrangle; lat. 42 degrees 53 minutes 35 seconds N. and long. 95 degrees 50 minutes 34 seconds W., NAD 27:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; moderately acid; clear smooth boundary.

A—8 to 12 inches; black (10YR 2/1) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; neutral; gradual smooth boundary.

AB—12 to 17 inches; very dark grayish brown (10YR 3/2) silty clay loam; some mixing of very dark grayish brown (2.5Y 3/2) subsoil material in the lower part; grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; black (10YR 2/1) coatings on faces of peds; neutral; gradual smooth boundary.

Bw1—17 to 25 inches; dark grayish brown (2.5Y 4/2) silty clay loam; weak fine subangular blocky structure; friable; few black (10YR 2/1) concretions (manganese oxides); common very dark grayish brown (10YR 3/2) coatings in root channels and on faces of peds; few fine distinct olive brown (2.5Y 4/4) and few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; neutral; gradual smooth boundary.

Bw2—25 to 36 inches; dark grayish brown (2.5Y 4/2) silty clay loam; weak fine subangular blocky structure; friable; common black (10YR 2/1) concretions (manganese oxides); few fine distinct olive brown (2.5Y 4/4) and few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly alkaline; gradual smooth boundary.

Bkg—36 to 49 inches; dark grayish brown (2.5Y 5/2) silt loam; weak coarse subangular blocky structure; friable; common black (10YR 2/1) concretions (manganese oxides); common very pale brown (10YR 8/2) calcium carbonate nodules; many medium distinct light olive brown

(2.5Y 5/4) and common fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cg—49 to 60 inches; mottled grayish brown (2.5Y 5/2) silt loam; massive; friable; many strong brown (7.5YR 5/6) redoximorphic concentrations; many black (10YR 2/1) concretions (manganese oxides); common very pale brown (10YR 8/2) calcium carbonate accumulations and few very pale brown (10YR 8/2) calcium carbonate nodules; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 24 to 48 inches
Thickness of the mollic epipedon: 14 to 24 inches
Depth to till: More than 60 inches
Other features: Some pedons have a 2C or 2Cg horizon below a depth of 60 inches.

Ap, A, and AB horizons:
Hue—10YR, 2.5Y, or N
Value—2 or 3
Chroma—0 to 2
Texture—silty clay loam
Reaction—moderately acid to neutral

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 or 3
Texture—silty clay loam or silt loam
Reaction—slightly acid to slightly alkaline

Bk or Bkg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silt loam or silty clay loam
Reaction—slightly alkaline or moderately alkaline

C or Cg horizon (if it occurs):
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—silt loam or silty clay loam
Reaction—slightly alkaline or moderately alkaline

2C or 2Cg horizon (if it occurs):
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—loam or clay loam
Reaction—slightly alkaline or moderately alkaline
Content of rock fragments—1 to 8 percent by volume

Ransom Series

Typical Pedon

Ransom silty clay loam, 1 to 3 percent slopes, in a cultivated field; 1,000 feet north and 1,200 feet west of the southeast corner of sec. 19, T. 94 N., R. 36 W., Herdland Township; USGS Sioux Rapids topographic quadrangle; lat. 42 degrees 56 minutes 33 seconds N. and long. 95 degrees 08 minutes 12 seconds W., NAD 27:

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine and medium angular blocky structure parting to weak fine granular; friable; common very fine and fine roots; neutral; clear smooth boundary.

A—8 to 13 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; common very fine and fine roots; slightly acid; gradual smooth boundary.

BA—13 to 17 inches; dark brown (10YR 3/3) and brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure parting to weak fine granular; friable; common very fine and fine roots; slightly acid; gradual smooth boundary.

Bw1—17 to 22 inches; brown (10YR 4/3) silty clay loam; weak fine and medium subangular blocky structure; friable; common very fine and fine roots; few distinct dark brown (10YR 3/3) coatings on faces of peds; slightly acid; gradual wavy boundary.

Bw2—22 to 34 inches; brown (10YR 4/3) silty clay loam; weak fine and medium subangular blocky structure; friable; common very fine and fine roots; few fine black (10YR 2/1) rounded iron-manganese nodules; few fine prominent strong brown (7.5YR 4/6) redoximorphic concentrations; common medium and coarse distinct dark grayish brown (2.5Y 4/2) redoximorphic depletions; neutral; clear smooth boundary.

2BC1—34 to 36 inches; dark grayish brown (2.5Y 4/2) loam; weak fine and medium subangular blocky structure; friable; common very fine and fine roots; few fine black (10YR 2/1) rounded iron-manganese nodules; about 2 percent gravel; common fine prominent strong brown (7.5YR 4/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; clear smooth boundary.

2BC2—36 to 80 inches; yellowish brown (10YR 5/4) loam; weak coarse prismatic structure; firm; common very fine and fine roots; common medium and coarse very pale brown (10YR 8/2) calcium carbonate nodules; about 2 percent gravel; common fine and medium prominent strong brown (7.5YR 4/6) and yellowish red (5YR 4/6) redoximorphic concentrations; many fine and medium prominent grayish brown (2.5Y 5/2) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 22 to 40 inches
Thickness of the mollic epipedon: 14 to 22 inches
Depth to till: 24 to 40 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam
Reaction—neutral or slightly acid

BA and Bw horizons:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—2 to 4
Texture—silty clay loam or silt loam
Reaction—slightly acid to slightly alkaline

2BC horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 5
Texture—clay loam or loam
Reaction—slightly alkaline or moderately alkaline

Ridgeport Series

Typical Pedon

Ridgeport sandy loam, 0 to 2 percent slopes, 100 feet west and 600 feet south of the northeast corner of sec. 31, T. 91 N., R. 28 W.; in Humboldt County, Iowa; USGS Humboldt topographic quadrangle; lat. 42 degrees 11 minutes 18 seconds N. and long. 94 degrees 16 minutes 58 seconds W., NAD 27:

Ap—0 to 8 inches; very dark brown (10YR 2/2) sandy loam, very dark grayish brown (10YR 3/2) dry; weak fine and medium granular structure; very friable; common fine roots; about 3 percent gravel; neutral; abrupt smooth boundary.

A—8 to 15 inches; very dark brown (10YR 2/2) sandy loam, very dark brown (10YR 2/2) dry; weak fine and medium granular structure; very friable; common fine roots; about 3 percent gravel; neutral; clear smooth boundary.

BA—15 to 19 inches; very dark grayish brown (10YR 3/2) sandy loam; weak fine subangular blocky structure parting to weak fine granular; very friable; common fine roots; few faint dark brown (10YR 3/3) organic coatings on faces of peds; about 5 percent gravel; neutral; gradual smooth boundary.

Bw1—19 to 25 inches; brown (10YR 4/3) sandy loam; weak fine subangular blocky structure; very friable; common fine roots; about 5 percent gravel; neutral; gradual smooth boundary.

Bw2—25 to 36 inches; brown (7.5YR 4/4) sandy loam; weak fine subangular blocky structure; very friable; common fine roots; about 7 percent gravel; neutral; gradual smooth boundary.

2BC—36 to 46 inches; brown (7.5YR 4/4) and strong brown (7.5YR 4/6) loamy sand; weak fine and medium subangular blocky structure; very friable; about 10 percent gravel; neutral; abrupt smooth boundary.

2C1—46 to 58 inches; brown (10YR 5/3) gravelly sand; single grain; loose; about 20 to 25 percent gravel; slightly effervescent; slightly alkaline; gradual smooth boundary.

2C2—58 to 80 inches; brown (10YR 5/3) gravelly sand; single grain; loose; about 20 to 25 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 24 to 50 inches
Thickness of the mollic epipedon: 10 to 24 inches
Depth to contrasting material: 24 to 40 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—2
Texture—sandy loam
Reaction—neutral or slightly acid

Bw horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—sandy loam
Reaction—neutral or slightly acid

2BC horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—loamy sand
Reaction—neutral or slightly alkaline

2C horizon:
Hue—10YR

Value—4 or 5
Chroma—3 or 4
Texture—gravelly sand
Reaction—slightly alkaline or moderately alkaline

Roine Series

Taxadjunct features: The Roine soil in map unit 875C2 does not have a mollic epipedon. This soil is classified as a loamy-skeletal, mixed, mesic Typic Eutrudept.

Typical Pedon

Roine fine sandy loam, 0 to 2 percent slopes, in a cultivated field; 2,440 feet north and 100 feet west of the southeast corner of sec. 14, T. 96 N., R. 38 W., Lone Tree Township; USGS Everly, Iowa, topographic quadrangle; lat. 43 degrees 08 minutes 03 seconds N. and long. 95 degrees 16 minutes 45 seconds W., NAD 27:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) and very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; common very fine to medium roots; slightly acid; abrupt smooth boundary.

A—8 to 12 inches; very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common very fine to medium roots; moderately acid; clear smooth boundary.

Bw1—12 to 22 inches; brown (7.5YR 4/4) fine sandy loam; weak fine and medium subangular blocky structure; friable; common fine and medium roots; slightly acid; gradual smooth boundary.

Bw2—22 to 38 inches; brown (7.5YR 4/4) loamy fine sand; weak fine and medium subangular blocky structure; very friable; common fine and medium roots; slightly acid; gradual smooth boundary.

Bw3—38 to 48 inches; brown (7.5YR 4/4 and 5/4), stratified loamy fine sand and sandy loam; weak fine and medium subangular blocky structure; very friable; common fine and medium roots; few fine distinct strong brown (7.5YR 5/6) redoximorphic concentrations; common fine prominent grayish brown (10YR 5/2) redoximorphic depletions; neutral; gradual smooth boundary.

2Cg1—48 to 52 inches; grayish brown (10YR 5/2) loam; massive; friable; common fine roots; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; gradual smooth boundary.

2Cg2—52 to 59 inches; grayish brown (10YR 5/2) silt loam; massive; friable; common fine roots; many medium and coarse rounded yellowish red (5YR 4/6) masses of iron; few medium rounded very dark grayish brown (10YR 3/2) iron-manganese nodules; many fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; gradual smooth boundary.

3Cg3—59 to 76 inches; grayish brown (10YR 5/2) clay loam; massive; firm; common fine and medium rounded yellowish red (5YR 4/6) masses of iron; few fine rounded very pale brown (10YR 8/2) calcium carbonate nodules; about 3 percent gravel; many fine and medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; gradual smooth boundary.

3Cg4—76 to 80 inches; grayish brown (2.5Y 5/2) clay loam; massive; firm; common fine and medium rounded strong brown (7.5YR 4/6) masses of iron; few medium very dark gray (10YR 3/1) iron-manganese nodules; about 3 percent gravel; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 40 to 80 inches
Thickness of the mollic epipedon: 10 to 16 inches
Depth to till: 40 to 60 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—fine sandy loam, loam, or sandy loam
Reaction—moderately acid to neutral

Bw horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—sandy loam, fine sandy loam, or loamy fine sand
Reaction—moderately acid to neutral

2Cg horizon:
Hue—2.5Y, 5Y, or 10YR
Value—4 to 6
Chroma—2 to 4
Texture—silt loam or loam
Reaction—slightly alkaline or moderately alkaline

3Cg horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—clay loam or loam
Reaction—slightly alkaline or moderately alkaline

Rolfe Series

Typical Pedon

Rolfe silt loam, depressional, 0 to 1 percent slopes, in a cultivated field; 110 feet east and 1,056 feet south of the center of sec. 3, T. 96 N., R. 35 W., Freeman Township; USGS Ruthven, Iowa, topographic quadrangle; lat. 43 degrees 09 minutes 34 seconds N. and long. 95 degrees 57 minutes 44 seconds W., NAD 27:

Ap—0 to 10 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.
E—10 to 16 inches; gray (2.5Y 5/1) silt loam, light gray (10YR 7/1) dry; weak thin platy structure parting to weak fine granular; friable; common medium prominent strong brown (7.5YR 5/8) redoximorphic concentrations; slightly acid; abrupt smooth boundary.
Btg1—16 to 21 inches; very dark gray (5Y 3/1) silty clay; strong medium and fine angular blocky structure; firm; distinct very dark gray (5Y 3/1) clay films on faces of peds; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; moderately acid; clear smooth boundary.
Btg2—21 to 32 inches; olive gray (5Y 4/2) silty clay; moderate fine prismatic structure parting to moderate fine angular blocky; firm; distinct very dark gray (5Y 3/1) clay films on faces of peds and prisms; common fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; moderately acid; gradual smooth boundary.
Btg3—32 to 41 inches; olive gray (5Y 5/2) silty clay; moderate fine prismatic structure parting to moderate medium angular blocky; firm; distinct very dark gray (5Y 3/1) clay films on faces of peds and prisms; few coarse prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; moderately acid; clear smooth boundary.
Btg4—41 to 50 inches; olive gray (5Y 5/2) clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; distinct very dark gray (5Y 3/1) clay films on faces of peds and prisms; common medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; moderately acid; abrupt wavy boundary.
2BCg—50 to 62 inches; olive gray (5Y 5/2) clay loam; weak medium prismatic structure; friable; about 2 percent gravel; many moderate prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; gradual smooth boundary.
2Cg—62 to 80 inches; olive gray (5Y 5/2) clay loam; massive; friable; about 2 percent gravel; common medium and fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 42 to 80 inches
Thickness of the mollic epipedon: 10 to 20 inches

Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam
Reaction—strongly acid to neutral

E horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—1 or 2
Texture—silt loam or loam
Reaction—strongly acid to slightly acid

Btg horizon:
Hue—5Y or 2.5Y
Value—3 to 6
Chroma—1 or 2
Texture—silty clay, clay, or clay loam
Reaction—moderately acid to neutral

2BCg and 2Cg horizons:
Hue—5Y or 2.5Y
Value—4 to 6
Chroma—1 to 3
Texture—clay loam or loam
Reaction—slightly alkaline

Rushmore Series

Typical Pedon

Rushmore silty clay loam, 0 to 2 percent slopes, in a cultivated field; 1,300 feet west and 1,000 feet north of the southeast corner of sec. 2, T. 97 N., R. 37 W., Summit Township; USGS Spencer, Iowa, topographic quadrangle; lat. 43 degrees 14 minutes 43 seconds N.

and long. 95 degrees 10 minutes 28 seconds W., NAD 27:

Ap—0 to 7 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; weak fine granular structure; friable; common very fine and fine roots; neutral; abrupt smooth boundary.

A1—7 to 15 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; weak medium granular structure; friable; common very fine and fine roots; neutral; gradual smooth boundary.

A2—15 to 21 inches; very dark gray (N 3/0) silty clay loam, dark gray (5Y 4/1) dry; weak very fine subangular blocky structure; friable; common very fine and fine roots; common fine prominent very dark grayish brown (2.5Y 3/2) redoximorphic depletions; slightly alkaline; clear smooth boundary.

Bg1—21 to 30 inches; olive gray (5Y 4/2) silty clay loam; weak fine subangular blocky structure; friable; common very fine and fine roots; few distinct very dark gray (5Y 3/1) organic coatings on faces of peds; common fine and medium prominent light olive brown (2.5Y 5/4) redoximorphic concentrations; slightly alkaline; gradual smooth boundary.

2Bg2—30 to 42 inches; olive gray (5Y 4/2) clay loam; weak fine and medium subangular blocky structure; firm; common very fine and fine roots; about 2 percent gravel; common fine and medium prominent light olive brown (2.5Y 5/4) redoximorphic concentrations; slightly effervescent; slightly alkaline; abrupt wavy boundary.

2BCg—42 to 52 inches; grayish brown (2.5Y 5/2) loam; weak very fine prismatic structure; firm; about 2 percent gravel; about 2 percent fine fragments of shale; common fine prominent yellowish brown (10YR 5/6) and many fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual smooth boundary.

2Cg—52 to 80 inches; grayish brown (2.5Y 5/2) loam; massive; firm; about 2 percent gravel; about 2 percent fine fragments of shale; many fine prominent yellowish brown (10YR 5/6) and common fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 15 to 36 inches
Thickness of the mollic epipedon: 14 to 24 inches
Depth to till: 24 to 40 inches

Ap and A horizons:
Hue—10YR, 2.5Y, 5Y, or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam
Reaction—slightly acid to slightly alkaline

Bg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay loam or silt loam
Reaction—neutral or slightly alkaline

2Bg and 2BCg horizons:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 to 4
Texture—clay loam or loam
Reaction—slightly alkaline or moderately alkaline

2Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6
Chroma—2 to 4
Texture—clay loam or loam
Reaction—slightly alkaline or moderately alkaline

Sac Series

Taxadjunct features: The Sac soil in map unit 77C2 does not have a mollic epipedon. This soil is classified as a fine-loamy, mixed, superactive, mesic Typic Eutrudept.

Typical Pedon

Sac silty clay loam, 2 to 5 percent slopes, in a cultivated field; 1,700 feet north and 400 feet west of the southeast corner of sec. 16, T. 95 N., R. 38 W., Clay Township; USGS Royal, Iowa, topographic quadrangle; lat. 43 degrees 02 minutes 39 seconds N. and long. 95 degrees 19 minutes 45 seconds W., NAD 27:

Ap—0 to 6 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common very fine and fine roots; common very fine and fine pores; slightly acid; clear smooth boundary.

A—6 to 12 inches; very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) dry; weak medium granular structure; friable; common very fine and fine roots; common very fine and fine pores; slightly acid; gradual smooth boundary.

AB—12 to 16 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 4/3) dry; weak fine subangular blocky structure parting to weak medium granular; friable; common very fine and fine roots; common very fine and fine pores; many distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; gradual smooth boundary.

Bw1—16 to 24 inches; brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; friable; common very fine roots; common very fine and fine pores; very few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; gradual smooth boundary.

Bw2—24 to 32 inches; brown (10YR 4/3) silty clay loam; weak fine and medium subangular blocky structure; friable; common very fine and fine pores; common fine and medium distinct dark yellowish brown (10YR 4/6) redoximorphic concentrations; neutral; abrupt wavy boundary.

2Bw3—32 to 38 inches; dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure; friable; common very fine and fine pores; few faint brown (10YR 4/3) coatings; about 3 percent rounded cobbles; common fine prominent grayish brown (2.5Y 5/2) redoximorphic depletions; strongly effervescent; slightly alkaline; abrupt wavy boundary.

2Bk1—38 to 46 inches; yellowish brown (10YR 5/4) clay loam; weak fine prismatic structure; firm; common very fine and fine pores; common fine and medium very pale brown (10YR 8/2) carbonate masses; about 2 percent rounded mixed cobbles and about 2 percent angular shale pebbles; common fine distinct grayish brown (10YR 5/2) redoximorphic depletions; strongly effervescent; moderately alkaline; clear wavy boundary.

2Bk2—46 to 55 inches; yellowish brown (10YR 5/6) clay loam; weak fine prismatic structure; firm; common very fine and fine pores; few prominent yellowish red (5YR 4/6) iron stains; common fine and medium very pale brown (10YR 8/2) carbonate masses; about 2 percent rounded mixed cobbles and 3 percent rounded mixed pebbles; common fine distinct yellowish brown (10YR 5/8) redoximorphic concentrations; common fine prominent grayish brown (2.5Y 5/2) redoximorphic depletions; strongly effervescent; moderately alkaline; clear wavy boundary.

2C1—55 to 70 inches; yellowish brown (10YR 5/6) clay loam; massive; firm; common very fine and fine pores; few fine and medium very pale brown (10YR 8/2) carbonate masses; about 2 percent rounded mixed cobbles, 2 percent rounded mixed gravel, and 3 percent angular shale fragments; common fine prominent grayish brown (2.5Y 5/2) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual smooth boundary.

2C2—70 to 80 inches; yellowish brown (10YR 5/4) clay loam; massive; firm; common very fine and fine pores; few fine and medium very pale brown (10YR 8/2) carbonate nodules; about 2 percent rounded mixed cobbles and 2 percent rounded mixed pebbles; common fine and medium prominent yellowish brown (10YR 5/8) redoximorphic concentrations; many fine and medium prominent grayish brown (2.5Y 5/2) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 20 to 40 inches
Thickness of the mollic epipedon: 10 to 20 inches
Depth to till: 20 to 40 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam
Reaction—moderately acid or slightly acid

AB or BA horizon:
Hue—10YR
Value—2 or 3
Chroma—2 or 3
Texture—silty clay loam
Reaction—moderately acid or slightly acid

Bw horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silty clay loam or silt loam
Reaction—slightly acid or neutral

2Bw horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—loam or clay loam
Reaction—slightly acid to slightly alkaline

2Bk horizon:
Hue—10YR
Value—4 or 5

Chroma—3 to 6
Texture—clay loam or loam
Reaction—slightly alkaline or moderately alkaline

2C horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—clay loam or loam
Reaction—slightly alkaline or moderately alkaline

Shandep Series

Typical Pedon

Shandep loam, 0 to 2 percent slopes, in a pasture; about 8 miles east of Hampton, in Franklin County, Iowa; 1,675 feet south and 75 feet east of the northwest corner of sec. 36, T. 92 N., R. 19 W.; USGS Ackley Northeast topographic quadrangle; lat. 42 degrees 44 minutes 24 seconds N. and long. 93 degrees 02 minutes 41 seconds W., NAD 27:

A1—0 to 5 inches; black (N 2/0) loam; moderate fine granular structure; friable; few pebbles; slightly acid; gradual smooth boundary.
A2—5 to 25 inches; black (N 2/0) clay loam; moderate fine granular structure; friable; few pebbles; slightly acid; gradual smooth boundary.
A3—25 to 29 inches; black (5Y 2/1) and very dark gray (5Y 3/1) clay loam; weak medium granular structure; friable; few pebbles; slightly acid; clear wavy boundary.
Bg1—29 to 37 inches; dark gray (5Y 4/1) clay loam; weak fine and medium subangular blocky structure; friable; few pebbles; slightly acid; gradual wavy boundary.
Bg2—37 to 45 inches; gray (5Y 5/1) loam; weak fine and medium subangular blocky structure; friable; few pebbles; slightly acid; clear wavy boundary.
2Cg—45 to 60 inches; dark gray (5Y 4/1) loamy sand; single grain; loose; few pebbles; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 26 to 36 inches
Depth to sandy material: 40 to 60 inches

A or Ap horizon:
Hue—5Y or N
Value—2 or 3
Chroma—0 or 1
Texture—clay loam or loam
Reaction—slightly acid to slightly alkaline

Bg horizon:
Hue—5Y or N
Value—4 or 5
Chroma—0 or 1
Texture—clay loam, loam, or silty clay loam
Reaction—slightly acid to slightly alkaline

2Cg horizon:
Hue—5Y
Value—4 or 5
Chroma—1
Texture—loamy sand or gravelly loamy sand
Reaction—slightly acid to moderately alkaline

Sparta Series

Typical Pedon

Sparta loamy sand, 5 to 9 percent slopes, in a cultivated field; 644 feet north and 2,277 feet west of the southeast corner of sec. 29, T. 97 N., R. 37 W., Summit Township; USGS Spencer, Iowa, topographic quadrangle; lat. 43 degrees 11 minutes 07 seconds N. and long. 95 degrees 13 minutes 47 seconds W., NAD 27:

Ap—0 to 8 inches; very dark brown (10YR 2/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine and medium granular structure; very friable; few fine and medium roots; slightly acid; abrupt smooth boundary.
A—8 to 13 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak very fine and fine granular structure; very friable; very fine and fine roots; very dark brown (10YR 2/2) organic coatings in the upper 2 inches; slightly acid; gradual smooth boundary.
Bw—13 to 25 inches; dark yellowish brown (10YR 4/4) loamy sand; some mixing of dark brown (10YR 3/3) loamy sand in the upper part; weak coarse subangular blocky structure; very friable; neutral; abrupt wavy boundary.
C1—25 to 36 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; neutral; gradual smooth boundary.
C2—36 to 48 inches; yellowish brown (10YR 5/4) sand; single grain; loose; neutral; gradual smooth boundary.
C3—48 to 60 inches; brownish yellow (10YR 6/6) sand; single grain; loose; neutral; gradual smooth boundary.
C4—60 to 80 inches; brownish yellow (10YR 6/6) sand; single grain; loose; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches

Ap and A horizons:
Hue—10YR or 7.5YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy sand
Reaction—strongly acid to neutral

Bw horizon:
Hue—10YR or 7.5YR
Value—3 to 6
Chroma—3 to 6
Texture—loamy sand, sand, or fine sand
Reaction—strongly acid to neutral

C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 6
Texture—sand or fine sand
Reaction—strongly acid to slightly alkaline

Spillville Series

Typical Pedon

Spillville loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; 333 feet north and 204 feet east of the center of sec. 12, T. 94 N., R. 37 W., Douglas Township; USGS Sioux Rapids, Iowa, topographic quadrangle; lat. 42 degrees 58 minutes 34 seconds N. and long. 95 degrees 09 minutes 36 seconds W., NAD 27:

Ap—0 to 7 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; neutral; abrupt smooth boundary.

A1—7 to 17 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; neutral; gradual smooth boundary.

A2—17 to 32 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine and medium subangular blocky structure parting to weak fine granular; friable; neutral; gradual smooth boundary.

A3—32 to 41 inches; very dark gray (10YR 3/1) loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; neutral; abrupt wavy boundary.

A4—41 to 52 inches; very dark gray (10YR 3/1) loam, dark gray (10YR 4/1) dry; weak coarse prismatic structure parting to weak fine and medium subangular blocky; friable; thin white (10YR 8/1) calcium carbonate coatings on faces of peds and prisms; slightly effervescent; slightly alkaline; gradual smooth boundary.

AC—52 to 58 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak coarse prismatic structure parting to weak fine and medium subangular blocky; friable; very dark gray (10YR 3/1) coatings on faces of peds and prisms; white (10YR 8/1) calcium carbonate coatings on faces of peds and prisms; few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; abrupt wavy boundary.

C1—58 to 67 inches; dark grayish brown (10YR 4/2) loam; massive; friable; few thin strata of grayish brown (10YR 5/2); common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; gradual wavy boundary.

C2—67 to 80 inches; dark grayish brown (10YR 4/2), stratified loam and sandy loam; massive (single grain in the coarser strata); friable (loose in the coarser strata); few thin strata of pale brown (10YR 6/3); about 3 to 5 percent gravel; many fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: More than 40 inches

A and AC horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam
Reaction—moderately acid to slightly alkaline

C horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—1 or 2
Texture—loam grading to stratified loamy sand
Reaction—neutral to moderately alkaline

Storden Series

Typical Pedon

Storden loam, in an area of Storden-Omsrud complex, 9 to 14 percent slopes, moderately eroded, in a cultivated field; 950 feet south and 2,150 feet west of the northeast corner of sec. 7, T. 97 N., R. 35 W., Lake

Township; USGS Dickens, Iowa, topographic quadrangle; lat. 43 degrees 14 minutes 21 seconds N. and long. 95 degrees 01 minute 20 seconds W., NAD 27:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; common fine and medium roots; about 5 percent gravel; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bk—7 to 16 inches; brown (10YR 5/3) loam; weak medium subangular blocky structure; friable; common very fine and fine roots; common medium rounded strong brown (7.5YR 5/6) iron concretions; few fine light gray (10YR 7/2) calcium carbonate threads; about 5 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

C1—16 to 55 inches; yellowish brown (10YR 5/4) loam; massive; friable; common very fine and fine roots; common medium rounded strong brown (7.5YR 5/6) iron concretions; few fine light gray (10YR 7/2) calcium carbonate threads; about 5 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—55 to 80 inches; yellowish brown (10YR 5/4) sandy loam; massive; friable; common very fine and fine roots; common medium rounded strong brown (7.5YR 5/6) iron concretions; few fine light gray (10YR 7/2) calcium carbonate threads; about 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Presence of carbonates: In all horizons

A or Ap horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 to 3
Texture—loam
Reaction—slightly alkaline or moderately alkaline

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 to 6
Texture—loam
Reaction—slightly alkaline or moderately alkaline

C horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 6
Texture—sandy loam or loam
Reaction—slightly alkaline or moderately alkaline

Sunburg Series

Typical Pedon

Sunburg loam, 9 to 14 percent slopes, moderately eroded, in a cultivated field; 2,400 feet south and 150 feet west of the northeast corner of sec. 20, T. 97 N., R. 35 W., Lake Township; USGS Ruthven, Iowa, topographic quadrangle; lat. 43 degrees 12 minutes 35 seconds N. and long. 94 degrees 59 minutes 13 seconds W., NAD 27:

Ap—0 to 5 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine roots; about 5 percent gravel; strongly effervescent; moderately alkaline; abrupt wavy boundary.

Bk—5 to 23 inches; light olive brown (2.5Y 5/4) loam; weak fine and medium subangular blocky structure; friable; few very fine roots; common very pale brown (10YR 8/2) masses of calcium carbonate; about 10 percent gravel; violently effervescent; moderately alkaline; abrupt wavy boundary.

C1—23 to 41 inches; light olive brown (2.5Y 5/4) loam; massive; friable; few very fine roots; few very pale brown (10YR 8/2) masses of calcium carbonate; about 10 percent gravel; violently effervescent; moderately alkaline; clear smooth boundary.

C2—41 to 56 inches; light olive brown (2.5Y 5/4) fine sandy loam; massive; very friable; few very pale brown (10YR 8/2) masses of calcium carbonate; about 10 percent gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

C3—56 to 70 inches; light olive brown (2.5Y 5/4) loam; massive; friable; about 10 percent gravel; common medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; clear smooth boundary.

C4—70 to 80 inches; light olive brown (2.5Y 5/4) fine sandy loam; massive; very friable; few fine and medium prominent strong brown (7.5YR 4/6) iron concretions; about 3 percent gravel; common medium faint yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 0 to 10 inches
Depth to carbonates: 0 to 10 inches

Ap horizon:
Hue—10YR
Value—3 or 4
Chroma—1 to 3
Texture—loam
Reaction—slightly alkaline or moderately alkaline

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 or 4
Texture—loam or fine sandy loam
Reaction—slightly alkaline or moderately alkaline

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 or 4
Texture—fine sandy loam, loam, or sandy loam
Reaction—slightly alkaline or moderately alkaline

Talcot Series

Typical Pedon

Talcot clay loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes, in a cultivated field; 2,600 feet east and 1,350 feet north of the southwest corner of sec. 27, T. 96 N., R. 35 W., Freeman Township; USGS Silver Lake, Iowa, topographic quadrangle; lat. 43 degrees 06 minutes 05 seconds N. and long. 94 degrees 57 minutes 46 seconds W., NAD 27:

Ap—0 to 7 inches; black (N 2/0) clay loam, very dark gray (N 3/0) dry; weak fine granular structure; friable; common fine and medium roots; strongly effervescent; slightly alkaline; clear smooth boundary.

A—7 to 21 inches; black (N 2/0) clay loam, very dark gray (N 3/0) dry; weak fine subangular blocky structure; friable; common fine and medium roots; violently effervescent; moderately alkaline; gradual wavy boundary.

AB—21 to 24 inches; very dark gray (5Y 3/1) and dark gray (5Y 4/1) clay loam, olive gray (5Y 5/2) dry; weak fine and medium subangular blocky structure; friable; common fine and medium roots; common black (10YR 2/1) iron-manganese nodules; common yellowish brown (10YR 5/8) iron concretions; common medium faint olive gray (5Y 4/2) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bg—24 to 36 inches; gray (5Y 5/1) clay loam; weak medium subangular blocky structure; friable; common fine and medium roots; common black (10YR 2/1) iron-manganese nodules; common yellowish brown (10YR 5/8) iron concretions; strongly effervescent; moderately alkaline; gradual wavy boundary.

2Cg1—36 to 38 inches; dark gray (5Y 4/2) gravelly loamy sand; single grain; loose; common very fine and fine roots; about 15 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

2Cg2—38 to 62 inches; dark gray (5Y 4/2) gravelly sand; single grain; loose; about 25 percent gravel; many fine and medium prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations and iron concretions; strongly effervescent; moderately alkaline; gradual wavy boundary.

2Cg3—62 to 80 inches; olive gray (5Y 4/2) gravelly sand; single grain; loose; about 25 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 14 to 24 inches
Depth to contrasting material: 24 to 40 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—2 or 3
Chroma—0 or 1
Texture—clay loam
Reaction—slightly alkaline or moderately alkaline

Bg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—clay loam, silty clay loam, or loam
Reaction—slightly alkaline or moderately alkaline

2Cg horizon:
Hue—2.5Y or 5Y
Value—2 to 6
Chroma—2 or 3
Texture—coarse sand, sand, or loamy sand or the gravelly analogs of these textures
Reaction—slightly alkaline or moderately alkaline

Terril Series

Typical Pedon

Terril loam, 2 to 5 percent slopes, in a cultivated field; 150 feet west and 210 feet north of the southeast corner of sec. 27, T. 94 N., R. 36 W., Herdland Township; USGS Webb, Iowa, topographic quadrangle; lat. 42 degrees 55 minutes 30 seconds N. and long. 95 degrees 04 minutes 22 seconds W., NAD 27:

Ap—0 to 7 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A1—7 to 16 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; common fine roots; slightly acid; gradual smooth boundary.

A2—16 to 24 inches; very dark brown (10YR 2/2) loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; friable; common fine roots; neutral; gradual smooth boundary.

A3—24 to 30 inches; very dark brown (10YR 2/2) and very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; common fine roots; neutral; gradual smooth boundary.

BA—30 to 36 inches; dark brown (10YR 3/3) clay loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure; friable; common fine roots; very dark grayish brown (10YR 3/2) coatings on faces of peds; neutral; clear smooth boundary.

Bw1—36 to 43 inches; dark brown (10YR 3/3) clay loam, brown (10YR 5/3) dry; moderate fine and medium subangular blocky structure; friable; neutral; gradual smooth boundary.

Bw2—43 to 51 inches; mixed dark brown (10YR 3/3) and brown (10YR 4/3) clay loam, brown (10YR 5/3) dry; moderate fine and medium subangular blocky structure; friable; neutral; gradual smooth boundary.

BC—51 to 61 inches; brown (10YR 4/3) clay loam; weak medium prismatic structure parting to moderate fine subangular blocky; friable; few fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; neutral; gradual smooth boundary.

C1—61 to 72 inches; mixed brown (10YR 4/3) and dark yellowish brown (10YR 4/4) loam; massive; friable; few and common fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; neutral; gradual smooth boundary.

C2—72 to 80 inches; yellowish brown (10YR 5/4) loam; massive; friable; common fine prominent grayish brown (2.5Y 5/2) redoximorphic depletions; common fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; neutral.

Range in Characteristics

Thickness of the mollic epipedon: More than 24 inches
Depth to carbonates: More than 40 inches
Depth to till: More than 40 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam or clay loam
Reaction—slightly acid or neutral

BA, Bw, and BC horizons:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—3 or 4
Texture—loam or clay loam
Reaction—slightly acid or neutral

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—loam, clay loam, or sandy loam
Reaction—neutral or slightly alkaline

Wacousta Series

Typical Pedon

Wacousta silty clay loam, depressional, 0 to 1 percent slopes, about 3 miles southwest of Bode; 850 feet north and 2,240 feet east of the southwest corner of sec. 25, T. 93 N., R. 30 W.; USGS Bode topographic quadrangle; lat. 42 degrees 50 minutes 10 seconds N. and long. 94 degrees 20 minutes 06 seconds W., NAD 27:

Ap—0 to 9 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; cloddy parting to weak medium granular structure; friable; neutral; clear smooth boundary.

A—9 to 14 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; very dark gray (10YR 3/1) kneaded; weak fine granular and weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

Bg—14 to 16 inches; dark gray (5Y 4/1) and olive gray (5Y 4/2) silty clay loam; weak medium subangular blocky structure; firm; common medium distinct olive brown (2.5Y 4/4) iron concentrations; slightly alkaline; clear smooth boundary.

Cg1—16 to 28 inches; olive gray (5Y 5/2) silty clay loam; massive; friable; some dark olive gray (5Y 3/2) materials in root channels; common medium distinct olive brown (2.5Y 4/4) and common coarse distinct yellowish brown (10YR 5/4) iron concentrations; slightly effervescent; slightly alkaline; diffuse smooth boundary.

Cg2—28 to 60 inches; light olive gray (5Y 6/2) silt loam; massive; friable; some very fine and fine sand grains; few fine dark oxides; common fine prominent yellowish brown (10YR 5/4) iron concentrations; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 12 to 20 inches
Thickness of the mollic epipedon: 8 to 18 inches

Ap or A horizon:
Hue—10YR or N
Value—2
Chroma—0 or 1
Texture—silty clay loam or mucky silty clay loam
Reaction—slightly alkaline to slightly acid

Bg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam
Reaction—neutral or slightly alkaline

Cg horizon:
Hue—5Y
Value—5 or 6
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—slightly alkaline or moderately alkaline

Wadena Series

Typical Pedon

Wadena loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes, in a cultivated field; 2,000 feet south and 150 feet west of the northeast corner of sec. 4, T. 96 N., R. 37 W., Summit Township; USGS Spencer, Iowa, topographic quadrangle; lat. 43 degrees 09 minutes 51 seconds N. and long. 95 degrees 12 minutes 38 seconds W., NAD 27:

Ap—0 to 8 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common very fine and fine roots; neutral; abrupt smooth boundary.
A—8 to 15 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common very fine and fine roots; slightly acid; gradual smooth boundary.
AB—15 to 18 inches; very dark grayish brown (10YR 3/2) loam; some mixing of brown (10YR 4/3) loam; brown (10YR 4/3) dry; weak fine subangular blocky structure; friable; common very fine and fine roots; slightly acid; clear smooth boundary.
Bw—18 to 29 inches; brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; common very fine and fine roots; slightly acid; abrupt wavy boundary.
2C1—29 to 55 inches; brown (7.5YR 4/3 and 4/4) gravelly sand; single grain; loose; about 30 percent gravel; neutral; clear smooth boundary.
2C2—55 to 80 inches; yellowish brown (10YR 5/4) very gravelly sand; single grain; loose; about 40 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 30 to 60 inches
Thickness of the mollic epipedon: 12 to 24 inches
Depth to contrasting material: 24 to 40 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam
Reaction—slightly acid or neutral

Bw horizon:
Hue—10YR or 7.5YR
Value—3 to 6
Chroma—3 or 4
Texture—loam or clay loam
Reaction—slightly acid or neutral

2C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2 to 4
Texture—coarse sand or sand or the gravelly or very gravelly analogs of these textures
Reaction—neutral to moderately alkaline

Waldorf Series

Typical Pedon

Waldorf silty clay, 0 to 2 percent slopes, in a cultivated field; 93 feet east and 1,800 feet south of the northwest corner of sec. 12, T. 96 N., R. 36 W., Sioux Township; USGS Dickens, Iowa, topographic quadrangle; lat. 43 degrees 08 minutes 50 seconds N. and long. 95 degrees 03 minutes 01 second W., NAD 27:

Ap—0 to 7 inches; black (N 2/0) silty clay, very dark gray (10YR 3/1) dry; moderate fine granular structure; firm; slightly acid; abrupt smooth boundary.
A—7 to 15 inches; black (10YR 2/1) silty clay, very

dark gray (10YR 3/1) dry; moderate fine granular structure; firm; slightly acid; gradual smooth boundary.

AB—15 to 22 inches; very dark gray (5Y 3/1) silty clay, dark gray (5Y 4/1) dry; moderate very fine subangular blocky structure; firm; many distinct black (10YR 2/1) organic coatings on faces of peds; common fine faint dark olive gray (5Y 3/2) redoximorphic depletions; neutral; clear smooth boundary.

Bg1—22 to 32 inches; olive gray (5Y 4/2) silty clay; moderate very fine prismatic structure parting to moderate very fine subangular blocky; firm; common distinct dark gray (5Y 4/1) organic coatings on faces of peds; common fine prominent light olive brown (2.5Y 5/4) redoximorphic concentrations; neutral; clear wavy boundary.

Bg2—32 to 40 inches; olive gray (5Y 5/2) silty clay; moderate very fine prismatic structure parting to moderate fine subangular blocky; firm; common distinct olive gray (5Y 4/2) organic coatings on faces of peds; many fine prominent light olive brown (2.5Y 5/4) redoximorphic concentrations; slightly effervescent; slightly alkaline; gradual smooth boundary.

Bkg1—40 to 48 inches; olive gray (5Y 5/2) clay; weak very fine prismatic structure parting to moderate fine and medium subangular blocky; firm; common fine very pale brown (10YR 8/2) masses of calcium carbonate; many fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; gradual smooth boundary.

Bkg2—48 to 56 inches; olive gray (5Y 5/2) silty clay; weak very fine prismatic structure parting to moderate fine and medium subangular blocky; firm; common fine very pale brown (10YR 8/2) masses of calcium carbonate; many fine prominent light olive brown (2.5Y 5/6) and common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; gradual smooth boundary.

BCg—56 to 69 inches; olive gray (5Y 5/2) silty clay; weak fine prismatic structure; firm; common fine very pale brown (10YR 8/2) masses of calcium carbonate; many fine prominent light olive brown (2.5Y 5/6) and common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; gradual smooth boundary.

Cg—69 to 80 inches; olive gray (5Y 5/2) silty clay loam; massive; friable; many fine prominent light olive brown (2.5Y 5/6) and common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 26 to 55 inches
Thickness of the mollic epipedon: 16 to 24 inches

Ap, A, and AB horizons:
Hue—10YR, 2.5Y, 5Y, or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay
Reaction—neutral or slightly acid

Bg and Bkg horizons:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay, silty clay loam, or clay
Reaction—neutral or slightly alkaline

BCg and Cg horizons:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—silty clay, silty clay loam, clay, or silt loam
Reaction—slightly alkaline or moderately alkaline

Webster Series

Typical Pedon

Webster silty clay loam, 0 to 2 percent slopes, in a cultivated field; 240 feet south and 288 feet west of the northeast corner of sec. 13, T. 94 N., R. 36 W., Herdland Township; USGS Webb, Iowa, topographical quadrangle; lat. 42 degrees 58 minutes 06 seconds N. and long. 95 degrees 02 minutes 06 seconds W., NAD 27:

Ap—0 to 7 inches; black (N 2/0) silty clay loam, black (10YR 2/1) dry; weak fine and medium subangular blocky structure parting to moderate fine granular; friable; slightly acid; abrupt smooth boundary.

A—7 to 14 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine and medium subangular blocky structure parting to moderate fine granular; friable; slightly acid; gradual smooth boundary.

AB—14 to 18 inches; black (10YR 2/1) silty clay loam grading to very dark gray (2.5Y 3/1) in the lower part; very dark gray (10YR 3/1) dry; moderate fine and medium subangular blocky structure; friable; neutral; clear smooth boundary.

Bg1—18 to 24 inches; dark gray (2.5Y 4/1) silty clay loam; moderate fine and medium angular and subangular blocky structure; friable; few very fine dark manganese concretions; distinct very dark gray (2.5Y 3/1) organic coatings on faces of peds; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; few medium faint grayish brown (2.5Y 5/2) redoximorphic depletions; neutral; gradual smooth boundary.

Bg2—24 to 30 inches; dark grayish brown (2.5Y 4/2) silty clay loam; moderate fine and medium angular and subangular blocky structure; friable; many fine dark manganese concretions; common fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; common medium and fine faint grayish brown (2.5Y 5/2) redoximorphic depletions; noneffervescent; slightly alkaline; clear smooth boundary.

Bg3—30 to 41 inches; olive gray (5Y 5/2) loam; weak fine and medium subangular blocky structure; friable; few medium and large prominent strong brown (7.5YR 5/6) iron oxides; many fine dark manganese concretions; thin lens of sandy loam at a depth of 39 to 41 inches; about 2 percent gravel; many fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; slightly effervescent; slightly alkaline; abrupt wavy boundary.

BCg—41 to 47 inches; olive gray (5Y 5/2) loam; weak fine and medium subangular blocky structure; friable; common fine dark manganese concretions; common white (10YR 8/1) calcium carbonate nodules; about 2 percent gravel; common fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; slightly effervescent; slightly alkaline; clear smooth boundary.

Cg1—47 to 56 inches; olive gray (5Y 5/2) loam; massive; friable; few fine dark manganese concretions; few white (10YR 8/1) calcium carbonate nodules; about 2 percent gravel; common fine prominent strong brown (7.5YR 5/8) redoximorphic concentrations; slightly effervescent; moderately alkaline; gradual smooth boundary.

Cg2—56 to 61 inches; olive gray (5Y 5/2) loam; massive; friable; common fine dark manganese concretions; few fine and medium strong brown (7.5YR 4/6) iron accumulations; few white (10YR 8/2) calcium carbonate nodules; about 3 percent gravel; many fine prominent strong brown (7.5YR 5/8) redoximorphic concentrations; slightly effervescent; moderately alkaline; clear smooth boundary.

Cg3—61 to 74 inches; olive gray (5Y 5/2) loam; massive; friable; very few dark manganese concretions; few very pale brown (10YR 8/2) calcium carbonate nodules; about 5 percent gravel; many fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly effervescent; moderately alkaline; clear smooth boundary.

Cg4—74 to 80 inches; olive gray (5Y 5/2) loam; massive; friable; common fine and medium dark manganese concretions; few fine distinct strong brown (7.5YR 5/8) iron oxides; few very pale brown (10YR 8/2) calcium carbonate nodules; about 5 percent gravel; many fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 24 to 60 inches
Thickness of the mollic epipedon: 14 to 24 inches

Ap, A, and AB horizons:
Hue—10YR, 2.5Y, or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam
Reaction—neutral or slightly acid

Bg horizon:
Hue—5Y or 2.5Y
Value—4 or 5
Chroma—1 or 2
Texture—clay loam, loam, or silty clay loam that has a high content of sand
Reaction—neutral or slightly alkaline

BCg horizon:
Hue—5Y or 2.5Y
Value—4 or 5
Chroma—1 or 2
Texture—loam or clay loam
Reaction—neutral or slightly alkaline

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—loam or sandy loam
Reaction—slightly alkaline or moderately alkaline

Wilmonton Series

Typical Pedon

Wilmonton clay loam, 1 to 3 percent slopes, in a cultivated field; 400 feet south and 1,850 feet east of the northwest corner of sec. 36, T. 96 N., R. 37 W., Riverton Township; USGS Greenville, Iowa, topographic quadrangle; lat. 43 degrees 05 minutes 43 seconds N. and long. 95 degrees 09 minutes 51 seconds W., NAD 27:

Ap—0 to 8 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; common very fine and fine roots; slightly acid; clear smooth boundary.

A—8 to 14 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; weak fine and medium subangular blocky structure; friable; common very fine and fine roots; neutral; gradual wavy boundary.

AB—14 to 19 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; common very fine and fine roots; common mixings of light olive brown (2.5Y 5/4) subsoil material; neutral; gradual wavy boundary.

2Bw—19 to 26 inches; light olive brown (2.5Y 5/4) clay loam; moderate medium subangular blocky structure; firm; common very fine and fine roots; very few distinct yellowish brown (10YR 5/8) iron oxide coatings on faces of peds and in pores; common medium black (10YR 2/1) wormcasts; common fine distinct grayish brown (2.5Y 5/2) redoximorphic depletions; neutral; gradual wavy boundary.

2Bk—26 to 35 inches; light olive brown (2.5Y 5/4) clay loam; moderate medium subangular blocky structure; firm; very few distinct yellowish brown (10YR 5/8) iron oxide coatings on faces of peds and in pores; common fine and medium white (10YR 8/1) calcium carbonate nodules; common fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; common fine faint grayish brown (2.5Y 5/2) redoximorphic depletions; slightly effervescent; slightly alkaline; clear wavy boundary.

2BC1—35 to 58 inches; light olive brown (2.5Y 5/4) clay loam; weak coarse prismatic structure; firm; few prominent yellowish brown (10YR 5/8) iron oxide coatings on faces of peds; common fine and medium white (10YR 8/1) calcium carbonate nodules; common fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; many medium and coarse distinct grayish brown (2.5Y 5/2) redoximorphic depletions; violently effervescent; moderately alkaline; gradual wavy boundary.

2BC2—58 to 80 inches; light olive brown (2.5Y 5/4) clay loam; weak coarse subangular blocky structure; firm; common fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; common fine and medium white (10YR 8/1) calcium carbonate nodules; many medium and coarse distinct grayish brown (2.5Y 5/2) redoximorphic depletions; violently effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 20 to 40 inches
Thickness of the mollic epipedon: 14 to 24 inches

Ap, A, and AB horizons:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—clay loam or silty clay loam
Reaction—slightly acid or neutral

2Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—clay loam or loam
Reaction—slightly acid or neutral

2Bk horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—loam or clay loam
Reaction—slightly alkaline or moderately alkaline

2BC horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—clay loam or loam
Reaction—slightly alkaline or moderately alkaline

Zenor Series

Taxadjunct features: The Zenor soil in map unit 828C2 does not have a mollic epipedon. This soil is classified as a coarse-loamy, mixed, superactive, mesic Typic Eutrudept.

Typical Pedon

Zenor sandy loam, 2 to 5 percent slopes, in a cultivated field; 2,150 feet west and 50 feet south of the northeast corner of sec. 25, T. 94 N., R. 35 W., Garfield Township; USGS Rush Lake West, Iowa, topographic quadrangle; lat. 42 degrees 56 minutes 18 seconds N. and long. 94 degrees 55 minutes 10 seconds W., NAD 27:

Ap—0 to 8 inches; very dark brown (10YR 2/2) sandy loam, very dark grayish brown (10YR 3/2) dry; weak fine and medium granular structure; friable; common very fine roots; about 5 percent gravel; neutral; abrupt smooth boundary.

A—8 to 14 inches; very dark brown (10YR 2/2) sandy loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; friable; common very fine roots; about 5 percent gravel; neutral; gradual wavy boundary.

AB—14 to 18 inches; dark brown (10YR 3/3) and brown (10YR 4/3) sandy loam; weak fine subangular blocky structure; friable; common very fine roots; about 5 percent gravel; neutral; gradual wavy boundary.

Bw—18 to 25 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine and medium subangular blocky structure; friable; common very fine roots; about 5 percent gravel; neutral; gradual wavy boundary.

C1—25 to 42 inches; yellowish brown (10YR 5/4) sandy loam; massive; friable; few medium very pale brown (10YR 8/2) calcium carbonate nodules; about 5 percent gravel; strongly effervescent; slightly alkaline; gradual wavy boundary.

C2—42 to 80 inches; yellowish brown (10YR 5/4) loamy sand; single grain; loose; few medium very pale brown (10YR 8/2) calcium carbonate nodules; about 5 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to 40 inches
Thickness of the mollic epipedon: 10 to 20 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam
Reaction—slightly acid or neutral

AB horizon:
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—sandy loam or loam
Reaction—slightly acid or neutral

Bw horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—sandy loam or loam
Reaction—slightly acid or neutral

C horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—5 to 7
Chroma—3 to 6
Texture—sandy loam, loamy sand, gravelly loamy sand, or gravelly sand
Reaction—neutral to moderately alkaline

Zook Series

Typical Pedon

Zook silty clay loam, 0 to 2 percent slopes, occasionally flooded, in a cultivated field; 2,200 feet north and 100 feet east of the southwest corner of sec. 9, T. 94 N., R. 36 W., Herdland Township; USGS Webb, Iowa, topographic quadrangle; lat. 42 degrees 59 minutes 13 seconds N. and long. 95 degrees 06 minutes 02 seconds W., NAD 27:

Ap—0 to 6 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; weak fine granular and weak fine angular blocky structure; friable; common very fine and fine roots; slightly acid; clear smooth boundary.

A1—6 to 19 inches; black (N 2/0) silty clay, very dark gray (N 3/0) dry; weak fine granular and weak fine angular blocky structure; friable; common very fine and fine roots; slightly acid; gradual wavy boundary.

A2—19 to 26 inches; black (N 2/0) silty clay, very dark gray (N 3/0) dry; weak medium subangular blocky and weak fine angular blocky structure; friable; common very fine roots; slightly acid; gradual wavy boundary.

A3—26 to 40 inches; black (N 2/0 and 10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; moderate fine and medium angular blocky structure; friable; common very fine roots; common very dark brown (10YR 2/2) pressure faces; neutral; gradual wavy boundary.

Bg1—40 to 54 inches; very dark gray (2.5Y 3/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine prismatic structure; friable; common very dark brown (10YR 2/2) pressure faces; neutral; gradual wavy boundary.

Bg2—54 to 74 inches; dark gray (5Y 4/1) silty clay; moderate fine prismatic structure; firm; many very dark grayish brown (10YR 3/2) pressure faces; common fine prominent olive brown (2.5Y 4/4) redoximorphic concentrations; neutral; gradual wavy boundary.

Cg—74 to 80 inches; very dark gray (2.5Y 3/1) silty clay; massive; firm; common very dark grayish brown (10YR 3/2) pressure faces; few fine prominent dark yellowish brown (10YR 4/4) redoximorphic concentrations; neutral.

Range in Characteristics

Depth to carbonates: 50 or more inches
Thickness of the mollic epipedon: 36 to 60 inches

A horizon:
Hue—10YR or N
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam or silty clay
Reaction—neutral to moderately acid

Bg and Cg horizons:
Hue—10YR to 5Y
Value—2 to 5
Chroma—1
Texture—silty clay loam or silty clay
Reaction—slightly acid or neutral

Formation of the Soils

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by five major 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 (Jenny, 1941). Human activities also affect soil formation.

Climate and plant and animal life, chiefly plants, are the active factors of soil formation. They act on parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. Relief conditions the effects of climate and plant and animal life. 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 the differentiation of soil horizons. A long period of time is generally 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 others.

Climate

The soils in Clay County formed under a variety of climatic conditions. The older soils of the MLRA 107 area, which is in the western two-thirds of the county, began forming following loess deposition about 12,500 years ago when the climate began to warm and become less humid. Although this part of Clay County was not glaciated during the Cary Glacial Period, the return to much colder conditions immediately to the east certainly had an effect on the type of vegetative growth and slowed down the formation processes. The soils of the MLRA 103 area, which is in the eastern one-third of the county, began forming following the last glacial period in Iowa. During the post-Cary glaciation period, 13,800 to 10,500 years ago, the climate was cool and the vegetation was dominantly conifers (Walker, 1966b). During the period beginning about 10,500 years ago and ending about 8,000 years ago, a warming trend changed the vegetation from conifers to mixed hardwoods. Beginning about 8,000 years ago, the climate became warmer and drier and herbaceous prairie vegetation became dominant. A change from a dry to a moister climate began about 3,000 years ago (McComb and Loomis, 1944). The present climate is referred to as subhumid and midcontinental.

A nearly uniform climate presently prevails throughout the survey area. The general climate has had an important overall influence on the characteristics of the soils but has not created major differences among them. The influence of the general climate of the region, however, is modified by local conditions. For example, soils on south-facing slopes formed under a microclimate that is warmer and less humid than the average climate in nearby areas. The climate under which poorly drained or very poorly drained soils in low areas, such as bottom lands or depressions, have been forming is typically wetter and colder than in most of the surrounding areas.

Changes in temperature activate the weathering of parent material by water and air. As the parent material weathers, changes caused by physical and chemical actions take place. Rainfall affects the amount of leaching in the soil and the kinds of plants that grow on the soil. Climate indirectly affects soil formation through the effects of temperature and other climatic factors on the plant and animal life on and in the soil. Clay County is on the border of the more humid conditions of central and eastern Iowa and the less humid conditions of western Iowa and the bordering states of South Dakota and Nebraska. The less humid conditions have had an influence on the soil properties of the reddish, gravelly soils of the May City series. These soils are high in iron and calcium carbonates because of the climatic effects on the weathering processes.

Living Organisms

All living organisms, including vegetation, animals, bacteria, and fungi, are important factors of soil formation, and plants are especially significant (McComb and others, 1961). Native grasses typically have an abundance of above-ground growth as well as a myriad of fibrous roots that penetrate the soil to an average depth of 10 to 20 inches. As these plants grow and, particularly, when they die, they add large amounts of organic matter to the surface layer and add various nutrients to the surface layer and the subsoil. Trees commonly feed on plant nutrients deep in the subsoil and contribute little organic material to the surface layer, other than that added by fallen leaves, twigs, and branches. Much of the organic material from dead trees actually remains on the soil surface.

Most of the soils of Clay County formed under prairie grasses (fig. 9) or a mixture of prairie grasses and water-tolerant plants. Some soils in Clay County formed strictly under vegetation consisting of water-tolerant plants. Clarion and Sac soils formed under prairie grasses. In areas that have not eroded, these soils typically have a dark surface layer that is 10 to 20 inches thick and have a content of organic matter of 3 to 5 percent. Afton and Webster soils formed under prairie grasses and water-tolerant plants. Klossner and Okoboji soils formed under vegetation consisting of water-tolerant plants. These soils typically have a black surface layer that is 20 to more than 30 inches thick and have a very high content of organic matter.

The vegetation chiefly determines the color of the surface layer and the content of organic matter and nutrients in the soil, and the roots create soil pores and root channels. Earthworms and other burrowing animals also help to create soil pores and keep the soil porous. Bacteria and fungi decompose the vegetation and thereby release plant nutrients.

Topography

Relief indirectly influences soil formation through its effect on soil drainage, runoff, and erosion. In the steeper areas, more water runs off the surface and less percolates into the soil. The higher runoff rate results in less leaching of carbonates and less movement of clay from the surface horizon into the subsoil. The susceptibility to erosion increases as slope increases. Much of Clay County is nearly level to moderately sloping, but small areas, particularly along the major rivers and streams, are strongly sloping to very steep.

The aspect of the slope affects soil formation. For example, south-facing slopes generally are warmer and drier than north-facing slopes. As a result, they typically support a different kind of vegetation.

The strongly sloping to steep Storden soils, gently sloping to strongly sloping Clarion soils, and nearly level and very gently sloping Nicollet soils, all of which formed in the same kind of parent material and under similar vegetation, differ because of differences in topographic position. The thickness and color of the A horizon and the thickness of the solum in these soils are affected by slope. The A horizon and the solum are thicker and the A horizon is darker in the less sloping soils than in steeper areas.

The nearly level and depressional soils in Clay County commonly have a gray or mottled subsoil as a result of poor aeration and restricted internal drainage. Gillett Grove, Okoboji, and Webster soils are examples. In the depressional Okoboji soils, water is periodically impounded on the surface, sometimes for weeks or longer. Rolfe soils are another example of depressional soils that impound water and are very poorly drained. As the Rolfe soils formed, the impounded water percolated through the surface layer, removing clay-sized particles and redepositing them in the subsoil. This movement of clay accelerated the formation of the Rolfe soils. These soils typically have a distinctly silty, light-colored subsurface layer and a gray, clayey subsoil.

The micro-relief of the nearly level Coland and Spillville soils on bottom land affects runoff, depth to the water table, and the rate at which new sediments are deposited. Coland soils are in low positions on the landscape, generally some distance from the main stream channel. They are poorly drained and impound water for short periods. Spillville soils are typically slightly higher on the landscape than the Coland soils, are generally closer to the stream channel, and are better drained.

Parent Material

The accumulation of parent material is the first step in the formation of a soil. Most soils formed in material that was transported from the site of the parent material and redeposited at a new location through the action of glacial ice, water, wind, and gravity. The principal kinds of parent material are glacial drift, loess, alluvium, eolian sands, lacustrine sediments, and organic material.

Glacial drift is rock material transported and deposited by glacial ice, including the material sorted and unsorted by meltwater. It includes till, glacial sediments, and glacial outwash. Till consists of unsorted deposits in which particles range in size from boulders to clay. Glacial sediments are the loamy

Figure 9.—Small areas of native prairie grasses and wildflowers are preserved throughout Clay County. These areas provide wildlife habitat, preserve plant species, and promote an appreciation for precultivation conditions. This type of prairie vegetation originally produced thick, dark topsoil across Clay County and northwestern Iowa.

materials that have been sorted to some extent by water. The fact that these sediments are in potholes or in other low areas on the landscape indicates that some of the sorting and deposition occurred since the time of glaciation as well as during the ice age. Glacial outwash is the sandy and gravelly material sorted by glacial meltwater and deposited in valleys (generally on relatively flat outwash plains) or in other areas where water was concentrated.

The area that is now Clay County underwent at least three major episodes of glaciation. These include at least two early Pleistocene glacial stages (previously called the Nebraskan and Kansan but now referred to collectively as the Pre-Illinoian) and the younger Wisconsinan glacial stage. The Pre-Illinoian till in Clay County is buried in all areas by drift of the Wisconsinan glacial stage. The area of the county in MLRA 107 has till that formed in the Tazewell substage, often referred to as the Sheldon Creek Formation of the Wisconsinan glacial stage. Radiocarbon dating indicates that this drift was deposited about 20,000 to 30,000 years ago. Most of the Sheldon Creek material is buried by 2 to 5 feet of loess or loamy surficial sediments. Moneta soils are the only soils in MLRA 107 area that developed completely in drift and are exposed at the soil surface by erosion of the loess. Moneta soils are on steep and very steep side slopes along the major rivers and streams. Everly soils formed in loamy sediments overlying the Sheldon Creek till on gently sloping and moderately sloping uplands. The area of the county in MLRA 103 has till that formed in the Cary substage of the Wisconsin glacial period (Ruhe, 1969). This area is often referred to as the Cary Lobe or Des Moines

Lobe. Radiocarbon dating indicates that this drift was deposited about 12,500 to 14,000 years ago. Most of the soils of the Cary substage occur on ground moraines and end moraines. Clarion, Nicollet, and Storden soils formed in till of the Cary substage. Canisteo, Harps, and Webster soils are in the lower areas on the landscape and formed in loamy sediments and till (Walker, 1966a). Okoboji soils formed in sediments derived from till that in some places eroded from nearby slopes. Zenor soils formed in glacial outwash.

Loess is silty material deposited by the wind. Loess consists mainly of silt- and clay-sized particles and small amounts (generally less than 15 percent) of fine and very fine sand. The loess in Clay County typically ranges from 20 to 60 inches in thickness and commonly overlies Tazewell-age drift. According to recent geology studies (Prior, 1991), the Wisconsin-age loess in Iowa ranges in age from about 12,500 to 31,000 years. The loess was transported to the area following extensive erosion of the glacial surface, which filled river valleys with massive amounts of sediment. Although some of the loess is from local sources near the area, most of the material originated from the Missouri River and Big Sioux River valleys.

Alluvium is sediment deposited by water along rivers and streams, in upland drainageways, in depressional areas, and on stream terraces. The texture of alluvium varies widely because of the differences in the material from which it was derived and the manner in which it was deposited. Coland, Spillville, and Zook soils formed in alluvium on bottom land that is subject to flooding, typically within large watershed areas. Alluvium that has been transported only a short distance is referred to as local alluvium. Local alluvium retains many of the characteristics of the soils from which it was transported. The calcareous Calco soils formed in local alluvium with the surrounding calcareous till as its source. Local alluvium transported and deposited by the forces of gravity, typically at the base or footslopes of much steeper slopes, is often referred to as colluvium. Terril soils formed in local alluvium and/or colluvium, commonly downslope from soils that formed in till. Biscay, Cylinder, and Wadena soils formed in loamy alluvium underlain by sand and gravel on stream terraces. The material from which these latter soils formed was mainly deposited by the meltwater from the receding Cary glacial substage.

Eolian soils formed in sandy material deposited by the wind, typically by the prevailing northwest winds. The source of the sands is local in origin, and the deposits are commonly in the uplands, particularly along the east side of the Little Sioux and Ocheyedan Rivers. Dickinson, Roine, and Sparta soils formed in eolian sands.

Lacustrine or glaciolacustrine sediment is typically fine textured, water-sorted material deposited by nearly still waters near the margin of the glacial ice rather than by rapidly moving meltwater. Lacustrine sediments originated as deposits in depressions and troughs on the Cary ice sheet. When the glacial ice melted, the sediments remained in closed depressions surrounded by till, or they stood out in relief as ridges. Lacustrine sediments are typically silty clay loam or silty clay and commonly range from 3 to 5 feet in thickness. Some of the lacustrine sediments have a thin mantle of loess or loamy sediments, and most are underlain directly by till or by thick redeposited sand and gravel overlying the till. These sediments are scattered across the MLRA 103 area of the county. Collinwood and Waldorf soils formed in these sediments.

The most extensive area of lacustrine sediments in Clay County occupies an area known geologically as Glacial Lake Spencer. This area lies mainly north and east of the city of Spencer and extends to nearby Dickens. This relict lake formed during the Post-Tazewell substage and prior to the Cary substage of the Wisconsinan glacial stage, when ice and/or debris blocked the flow of the Little Sioux River near Gillett Grove. The lake emptied when the blockage was breached by glacial meltwater, most likely from the immediately adjacent Cary Lobe. Geological evidence indicates that the drainage from this large watershed, which had supposedly drained to the Mississippi River prior to the creation of the lake, changed its course when the ice dam was breached. The new channel that was created flowed to the Missouri River. The silty to clayey lacustrine sediments in the relict Glacial Lake Spencer area are as much as 15 to 20 feet thick. Belmann soils and the Dickinson and Ocheyedan soils that have a lacustrine substratum formed in the Glacial Lake Spencer area.

Organic material consists of partially decomposed plant materials that accumulated in old lakebeds, marshy areas, and side hill seeps that supported a heavy growth of aquatic plants. Till, lacustrine sediment, or some other less permeable material typically underlies these deposits and has kept the surrounding area wet. In places, these organic materials exceed 4 feet in thickness. Klossner soils formed in organic deposits in marshy areas and old lakebeds. Some soils, such as Knoke mucky silty clay loam, have a thin surface layer that formed in organic material, although the rest of the profile formed in alluvial sediments. Many unique areas of organic material, called fens, formed mainly on steep or very steep slopes where water-saturated gravel, underlain by denser till on the upper part of the slopes, results in side hill seeps. These areas typically have hydrophytic flora and fauna that do not exist in other areas of organic soils. Fen Valley, an area near Gillett Grove preserved by the Iowa Department of Natural Resources, contains many of the fens in Clay County. Most of the original organic soils in the county, including many of the fens areas, have been artificially drained.

Time

The passage of time enables relief, climate, and plant and animal life to bring about changes in the parent material. If these factors are active for long periods, very similar kinds of soil can form in widely different kinds of parent materials. Soil formation, however, is generally interrupted by geologic events that expose new parent materials. In Clay County, new parent material has been added to the entire upland landscape at least four times (Simonson and others, 1952). The bedrock was covered by Pre-Illinoian glacial drift at least twice, by loess and by glacial drift of the Tazewell substage of the Wisconsinan glacial stage. The eastern one-third of the county was covered by the Cary substage of the Wisconsinan glacial stage, which overlies the previous materials. New parent material is added to the upland drainageways and to the bottom land with every passing erosional or flooding event and typically creates the youngest soils in the county.

Geologically, the soils of Clay County are young. The radiocarbon technique for determining the age of carbonaceous material found in organic deposits as well as in till has made it possible to determine the approximate age of the soil materials in Iowa. The dating process has indicated that the soils that formed in loess in the MLRA 107 area are at least 12,500 years old. In much of Iowa, including Clay County, erosion has beveled and in places removed the loess material from side slopes and redeposited it as new sediment downslope. Thus, the surfaces of the soils on nearly level and very gently sloping upland divides, such as McCreath soils, are older than the eroded side slopes of the Sac soils (less than 12,500 years). Both the McCreath and Sac soils are older than the alluvial or colluvial sediments of the Afton soils in upland drainageways. Further dating and research indicate that the alluvium deposited at the base of steep side slopes and on bottom land along major rivers and streams is less than 3,000 years old. Terril soils on footslopes and Colo, Coland, and Spillville soils on bottom land represent some of the younger soils in Clay County.

Human Activities

Important changes take place in the soil after it is artificially drained and cultivated or altered for such activities as the construction of homes or commercial buildings. Some of these changes have little effect on the processes of soil formation, but others have dramatic effects.

Changes by erosion generally are the most significant. Some of the cultivated or excavated soils in the county, particularly the steeper ones, have lost much of the original surface layer through sheet erosion. This loss of organic matter as well as the finer structure typical in the upper part of the soil profile can reduce vegetative cover and increase runoff. Fortunately, because of the large areas of the county with low relief, many of the soils have not been significantly affected by accelerated erosion.

Artificial drainage of soils, particularly in the MLRA 103 area of the county, has improved conditions for cultivated crop growth but has lowered the water table, increased soil temperature, and changed chemical reactions in these normally cooler, wetter soils.

Such human activities as soil excavation, tree removal, and building construction can also alter the natural soil formation processes through soil compaction and the subsequent decrease in percolation rates.

Management practices have increased the productivity of some soils and have reclaimed areas that otherwise were not suitable for crop production or building sites. Crops can be grown, for example, in many areas where subsurface drainage has sufficiently lowered the water table. Applications of commercial fertilizers have helped to overcome the deficiencies in plant nutrients and organic matter and thus have increased the productivity of many soils, particularly in moderately or severely eroded areas. A knowledge of the soils and history of human activity in specific areas helps to determine whether natural soil conditions occur in that area.

References

American Association of State Highway and Transportation Officials (AASHTO). 2000. Standard specifications for transportation materials and methods of sampling and testing. 20th edition, 2 volumes.

American Society for Testing and Materials (ASTM). 2001. Standard classification of soils for engineering purposes. ASTM Standard D 2487–00.

Fisher, Charles S. 1969. Soil survey of Clay County, Iowa. U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the Iowa Agricultural Experiment Station.

Iowa State University. 2002. Iowa profiles—Clay County data. Department of Economics.

Jenny, Hans. 1941. Factors of soil formation.

McComb, A.L., and W.E. Loomis. 1944. Sub-climax prairie. Torrey Botany Club Bulletin 71: 45–76.

McComb, A.L., and others. 1961. Effect of vegetation on soils in the forest-prairie region. Recent Advances in Botany, pp. 1627–1631.

Prior, Jean C. 1991. Landforms of Iowa. Iowa Department of Natural Resources, Iowa Geological Survey Bureau.

Ruhe, Robert V. 1969. Quaternary landscapes in Iowa.

Ruhe, Robert V., and P.H. Walker. 1968. Hillslope models and soil formation: I, Open systems. Transactions of the 9th International Congress of Soil Science, Adelaide, Australia, volume 4, pp. 551–560.

Simonson, Roy W., and others. 1952. Understanding Iowa soils.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

United States Department of Agriculture. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.

United States Department of Agriculture. 1981. Land resource regions and major land resource areas of the United States. U.S. Department of Agriculture Handbook 296.

United States Department of Agriculture. 2003. National soil survey handbook, title 430–VI. [Online] Available: http://soils.usda.gov/technical/handbook/.

Walker, Patrick H. 1966a. Post-glacial environments in relation to landscape and soils on the Cary Drift, Iowa. Iowa State University Resource Bulletin 549: 838–875.

Walker, Patrick H. 1966b. Post-glacial erosion and environment changes in central Iowa. Soil and Water Conservation 21: 21–23.

Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas 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

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope (fig. 10). In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Basal till. Compact till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills (fig. 10) consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Beach deposits. Material, such as sand and gravel, that is generally laid down parallel to an active or relict shoreline of a post-glacial or glacial lake.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench (structural). A platformlike, nearly level to gently inclined erosional surface developed in resistant strata in areas where valleys are cut in alternating strong and weak layers that are essentially horizontal.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

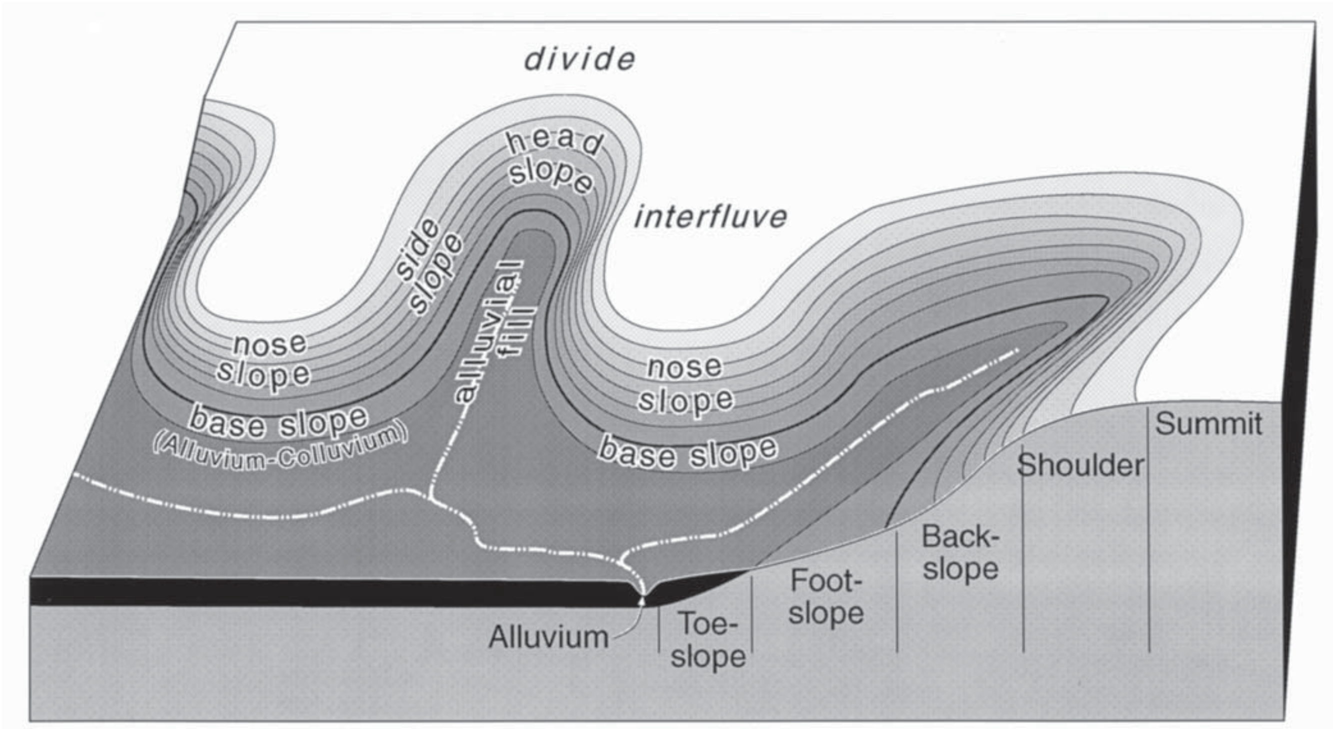


Figure 10.—Landscape relationship of geomorphic components and hillslope positions (modified after Ruhe and Walker, 1968).

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

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.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or 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 or miscellaneous areas 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 or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

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. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divide. (a) The line of separation, or (b) the summit area, or narrow tract of higher ground that constitutes the watershed boundary between two adjacent drainage basins (fig. 10); it divides the surface waters that flow naturally in one direction from those that flow in the opposite direction.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

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.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of 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, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Esker. A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

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.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain splay. A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope (fig. 10). In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

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.

Geomorphology. The science that treats the general configuration of the earth's surface; specifically the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and the history of geologic changes as recorded by these surface features. The term is especially applied to the genetic interpretation of landforms.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. 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.

Gumbotil. A sticky clay formed by the thorough weathering of glacial drift.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway (fig. 10). The overland waterflow is converging.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-chroma zones. Zones having chroma of 3 or more. Typical color in areas of iron concentrations.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

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. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil 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, a plowed surface horizon, most of which was originally part of a B horizon.

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 A horizon. The B horizon is in part a layer of transition from the overlying A 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) 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 soil material. 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.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it 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 potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Ice-walled lake plain. A relict surface marking the floor of an extinct lake basin that was formed on solid ground and surrounded by stagnant ice in a stable or unstable superglacial environment on stagnation moraines. As the ice melted, the lake plain became perched above the adjacent landscape. The lake plain is well sorted, generally fine textured, stratified deposits.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. An elevated area between two drainageways that sheds water to those drainageways (fig. 10).

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron concentrations. High-chroma zones having a high content of iron and manganese oxide because of chemical oxidation and accumulation, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic concentration.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. An irregular, short ridge or hill of stratified glacial drift.

Kame moraine. An end moraine that contains numerous kames. A group of kames along the front of a stagnant glacier, commonly comprising the slumped remnants of a formerly continuous outwash plain built up over the foot of rapidly wasting or stagnant ice.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake bed. The bottom of a lake; a lake basin.

Lake plain. A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace. A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Lakeshore. A narrow strip of land in contact with or bordering a lake; especially the beach of a lake.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Low-chroma zones. Zones having chroma of 2 or less. Typical color in areas of iron depletions.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Meander scroll. One of a series of long, parallel, close fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

MLRA (major land resource area). A geographic area characterized by a particular pattern of land uses, elevation and topography, soils, climate, water resources, and potential natural vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. 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, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

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.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside (fig. 10). The overland waterflow is predominantly divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace. An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Parts per million (ppm). The concentration of a substance in the soil, such as phosphorus or potassium, in one million parts of air-dried soil on a weight per weight basis.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

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 movement of water through the soil.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as “saturated hydraulic conductivity,” which is defined in the “Soil Survey Manual.” In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as “permeability.” Terms describing permeability, measured in inches per hour, are as follows:

Impermeable	less than 0.0015 inch
Very slow	0.0015 to 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

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Phosphorus. The amount of phosphorus available to plants at a depth of 30 to 42 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available phosphorus are:

Very low	less than 7.5 ppm
Low	7.5 to 13.0 ppm
Medium	13.0 to 22.5 ppm
High	more than 22.5 ppm

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitted outwash plain. An outwash plain marked by many irregular depressions, such as kettles, shallow pits, and potholes, which formed by melting of incorporated ice masses.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potassium. The amount of potassium available to plants at a depth of 12 to 24 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available potassium are:

Very low	less than 50 ppm
Low	50 to 79 ppm
Medium	79 to 125 ppm
High	more than 125 ppm

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

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:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth’s surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

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.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity. See Permeability.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope (fig. 10). It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside (fig. 10). The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

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 and by the passage of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stagnation moraine. A body of drift released by the melting of a glacier that ceased flowing. Commonly but not always occurs near ice margins; composed of till, ice-contact stratified drift, and small areas of glacial lake sediment. Typical landforms are knob-and-kettle topography, locally including ice-walled lake plains.

Stone line. A concentration of rock fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stream terrace. A platform or series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream, and representing the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former stage of fluvial erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope (fig. 10). It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 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, considered collectively. It includes all subdivisions of these horizons.

Swale. A slight depression in the midst of generally level land. A shallow depression in an undulating ground moraine caused by uneven glacial deposition.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology). A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lakeshore, or seashore. The term is usually applied to both the relatively flat summit surface (tread), cut or built by stream or wave action, and the steeper descending slope (scarp or riser), graded to a lower base level of erosion.

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.”

Till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Till plain. An extensive area of nearly level to undulating soils underlain by till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope (fig. 10). Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth’s surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1961-90 at Spencer, Iowa)

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Average	Temperature: 2 years in 10 will have-- Maximum temperature higher than--	Temperature: 2 years in 10 will have-- Minimum temperature lower than--	Temperature: Average number of growing degree days*	Precipitation: Average	Precipitation: 2 years in 10 will have-- Less than--	Precipitation: 2 years in 10 will have-- More than--	Precipitation: Average number of days with 0.10 inch or more	Precipitation: Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	24.6	4.6	14.6	52	-26	0	0.50	0.20	0.75	1	4.0
February---	29.7	10.0	19.8	57	-22	0	.65	.16	1.04	1	8.6
March------	41.3	22.1	31.7	77	-8	10	2.01	.93	2.93	4	5.5
April------	58.4	35.2	46.8	88	14	82	2.66	1.30	3.84	5	.6
May--------	71.5	47.1	59.3	93	26	310	3.59	2.45	4.64	7	.0
June-------	80.8	57.2	69.0	98	40	570	3.89	2.22	5.38	7	.0
July-------	84.8	61.6	73.2	99	46	718	4.16	1.49	6.39	6	.0
August-----	81.8	58.4	70.1	97	42	623	3.86	1.94	5.54	6	.0
September--	72.9	49.0	61.0	94	28	342	3.30	1.37	4.94	6	.0
October----	61.7	37.0	49.4	86	17	110	1.96	.69	3.01	4	.0
November---	42.6	23.5	33.1	69	-4	6	1.18	.31	1.88	2	1.9
December---	27.6	9.3	18.5	57	-20	0	.72	.28	1.09	2	6.5
Yearly:											
Average---	56.5	34.6	45.5	---	---	---	---	---	---	---	---
Extreme---	104	-33	---	100	-27	---	---	---	---	---	---
Total-----	---	---	---	---	---	2,773	28.50	18.96	32.06	51	27.1

* 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 1961-90 at Spencer, 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. 26	May 11	May 16
2 years in 10 later than--	Apr. 21	May 5	May 11
5 years in 10 later than--	Apr. 12	Apr. 25	May 2
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 28	Sept. 23	Sept. 16
2 years in 10 earlier than--	Oct. 4	Sept. 28	Sept. 21
5 years in 10 earlier than--	Oct. 16	Oct. 8	Sept. 29

Table 3.--Growing Season

(Recorded in the period 1961-90 at Spencer, 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	164	147	132
8 years in 10	171	153	138
5 years in 10	185	166	150
2 years in 10	199	178	162
1 year in 10	207	185	168

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
6	Okoboji silty clay loam, depressional, 0 to 1 percent slopes	3,898	1.1
27B	Terril loam, 2 to 5 percent slopes	1,748	0.5
27C	Terril loam, 5 to 9 percent slopes	1,013	0.3
27D	Terril loam, 9 to 14 percent slopes	277	*
31	Afton silty clay loam, 0 to 2 percent slopes	5,587	1.5
34B	Estherville sandy loam, 2 to 5 percent slopes	178	*
41C	Sparta loamy sand, 5 to 9 percent slopes	790	0.2
48	Knoke mucky silty clay loam, depressional, 0 to 1 percent slopes	264	*
54	Zook silty clay loam, 0 to 2 percent slopes, occasionally flooded	1,163	0.3
55	Nicollet loam, 1 to 3 percent slopes	13,696	3.7
62F	Storden loam, 18 to 25 percent slopes	456	0.1
77B	Sac silty clay loam, 2 to 5 percent slopes	14,108	3.9
77C	Sac silty clay loam, 5 to 9 percent slopes	480	0.1
77C2	Sac silty clay loam, 5 to 9 percent slopes, moderately eroded	1,003	0.3
90	Okoboji mucky silty clay loam, depressional, 0 to 1 percent slopes	955	0.3
95	Harps loam, 0 to 2 percent slopes	1,825	0.5
107	Webster silty clay loam, 0 to 2 percent slopes	13,450	3.7
108	Wadena loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes	15,011	4.1
108B	Wadena loam, 24 to 32 inches to sand and gravel, 2 to 5 percent slopes	4,700	1.3
133	Colo silty clay loam, 0 to 2 percent slopes, occasionally flooded	7,052	1.9
135	Coland clay loam, 0 to 2 percent slopes, occasionally flooded	3,182	0.9
138B	Clarion loam, 2 to 5 percent slopes	23,210	6.3
138C2	Clarion loam, 5 to 9 percent slopes, moderately eroded	8,186	2.2
175	Dickinson fine sandy loam, 0 to 2 percent slopes	1,945	0.5
175B	Dickinson fine sandy loam, 2 to 5 percent slopes	498	0.1
191	Rushmore silty clay loam, 0 to 2 percent slopes	3,603	1.0
201B	Coland-Terril complex, 1 to 5 percent slopes	2,926	0.8
202	Cylinder loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes	4,809	1.3
203	Cylinder loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes	5,705	1.6
221	Klossner muck, depressional, 0 to 1 percent slopes	757	0.2
259	Biscay clay loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes	8,021	2.2
274	Rolfe silt loam, depressional, 0 to 1 percent slopes	117	*
282	Ransom silty clay loam, 1 to 3 percent slopes	12,241	3.3
308	Wadena loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes	2,006	0.5
308B	Wadena loam, 32 to 40 inches to sand and gravel, 2 to 5 percent slopes	770	0.2
354	Aquolls (marsh), ponded, 0 to 1 percent slopes	2,337	0.6
375	Fostoria clay loam, lacustrine substratum, 1 to 3 percent slopes	1,834	0.5
376F	Cornell silty clay loam, 18 to 25 percent slopes	665	0.2
379	Ocheyedan clay loam, lacustrine substratum, 0 to 2 percent slopes	284	*
379B	Ocheyedan clay loam, lacustrine substratum, 2 to 5 percent slopes	994	0.3
379C2	Ocheyedan clay loam, lacustrine substratum, 5 to 9 percent slopes,		*
	moderately eroded	121	*
384	Collinwood clay, 1 to 3 percent slopes	284	*
390	Waldorf silty clay, 0 to 2 percent slopes	1,692	0.5
397	Letri clay loam, 0 to 2 percent slopes	8,951	2.4
433E	Moneta clay loam, 14 to 18 percent slopes	1,279	0.3
433F	Moneta clay loam, 18 to 25 percent slopes	2,433	0.7
433G	Moneta clay loam, 25 to 40 percent slopes	2,997	0.8
455	Wilmonton clay loam, 1 to 3 percent slopes	10,101	2.8
456	Wilmonton silty clay loam, 1 to 3 percent slopes	4,118	1.1
485	Spillville loam, 0 to 2 percent slopes, occasionally flooded	1,035	0.3
506	Wacousta silty clay loam, depressional, 0 to 1 percent slopes	345	*
507	Canisteo clay loam, 0 to 2 percent slopes	11,875	3.2
541C	Estherville-Hawick complex, 5 to 9 percent slopes	1,283	0.4
559	Talcot clay loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes	5,859	1.6
577B	Everly clay loam, 2 to 5 percent slopes	17,348	4.7
577C2	Everly clay loam, 5 to 9 percent slopes, moderately eroded	2,944	0.8
637D2	Everly-Moneta complex, 9 to 14 percent slopes, moderately eroded	1,508	0.4

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
638C2	Clarion-Storden complex, 5 to 9 percent slopes, moderately eroded	652	0.2
672	May City sandy clay loam, 0 to 2 percent slopes	1,543	0.4
672B	May City sandy clay loam, 2 to 5 percent slopes	580	0.2
672C2	May City sandy clay loam, 5 to 9 percent slopes, moderately eroded	129	*
709	Fairhaven silt loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes	389	0.1
733	Calco silty clay loam, 0 to 2 percent slopes, occasionally flooded	1,308	0.4
735	Havelock clay loam, 0 to 2 percent slopes, occasionally flooded	102	*
740D	Hawick gravelly loamy sand, 9 to 14 percent slopes	519	0.1
810	Galva silty clay loam, terrace, 0 to 2 percent slopes	572	0.2
810B	Galva silty clay loam, terrace, 2 to 5 percent slopes	75	*
828B	Zenor sandy loam, 2 to 5 percent slopes	15	*
828C2	Zenor sandy loam, 5 to 9 percent slopes, moderately eroded	6	*
835D2	Storden-Omsrud complex, 9 to 14 percent slopes, moderately eroded	2,320	0.6
835E2	Storden-Omsrud complex, 14 to 18 percent slopes, moderately eroded	561	0.2
854D	Histosols, fens, 2 to 25 percent slopes	16	*
874	Dickinson sandy loam, lacustrine substratum, 0 to 2 percent slopes	275	*
874B	Dickinson sandy loam, lacustrine substratum, 2 to 5 percent slopes	337	*
874C2	Dickinson sandy loam, lacustrine substratum, 5 to 9 percent slopes, moderately eroded	60	*
875	Roine fine sandy loam, 0 to 2 percent slopes	518	0.1
875B	Roine fine sandy loam, 2 to 5 percent slopes	1,769	0.5
875C2	Roine fine sandy loam, 5 to 9 percent slopes, moderately eroded	185	*
878	Ocheyedan loam, 0 to 2 percent slopes	386	0.1
878B	Ocheyedan loam, 2 to 5 percent slopes	593	0.2
879	Fostoria loam, 1 to 3 percent slopes	1,429	0.4
928	Annieville silty clay loam, 0 to 2 percent slopes	1,652	0.5
928B	Annieville silty clay loam, 2 to 5 percent slopes	401	0.1
992	Gillett Grove silty clay loam, depressional, 0 to 1 percent slopes	637	0.2
1053	Belmann clay loam, gypsum phase, 0 to 2 percent slopes	558	0.2
1091	McCreath silty clay loam, 0 to 2 percent slopes	49,134	13.4
1092	Gillett Grove silty clay loam, 0 to 2 percent slopes	36,541	10.0
1133	Colo silty clay loam, channeled, 0 to 2 percent slopes, frequently flooded	3,574	1.0
1259	Biscay clay loam, 32 to 40 inches to sand and gravel, depressional, 0 to 1 percent slopes	794	0.2
1385	Ocheda silty clay loam, 1 to 3 percent slopes	979	0.3
1508	Belmann clay loam, 0 to 2 percent slopes	2,221	0.6
1585	Spillville-Coland complex, channeled, 0 to 2 percent slopes, frequently flooded	5,514	1.5
4000	Urban land	172	*
5010	Pits, sand and gravel	631	0.2
5040	Udorthents, loamy (cut and fill land)	254	*
5060	Pits, clay	6	*
AW	Animal waste	2	*
SL	Sewage lagoon	23	*
W	Water	3,051	0.8
	Total	366,400	100.0

* Less than 0.1 percent.

Table 5.--Cropland Management Considerations

(See text for a description of the considerations listed in this table)

Map symbol and component name	Cropland management considerations
6:	
Okoboji	Ponding Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table
27B:	
Terril	Potential for surface-water contamination Water erosion
27C:	
Terril	Potential for surface-water contamination Water erosion
27D:	
Terril	Potential for surface-water contamination Water erosion
31:	
Afton	Potential poor tilth and compaction Potential for ground-water contamination Seasonal high water table
34B:	
Estherville	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
41C:	
Sparta	Excessive permeability Limited available water capacity Limited content of organic matter Potential for ground-water contamination Potential for surface-water contamination Wind erosion
48:	
Knoke	Lime content Ponding Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table Wind erosion
54:	
Zook	Flooding Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table
55:	
Nicollet	Potential for ground-water contamination Seasonal high water table

Table 5.--Cropland Management Considerations--Continued

Map symbol and component name	Cropland management considerations
62F:	
Storden	Slope Lime content Potential for surface-water contamination Water erosion Wind erosion
77B:	
Sac	Potential poor tilth and compaction Potential for surface-water contamination Water erosion
77C:	
Sac	Potential poor tilth and compaction Potential for surface-water contamination Water erosion
77C2:	
Sac, moderately eroded	Potential poor tilth and compaction Potential for surface-water contamination Previously eroded Water erosion
90:	
Okoboji mucky silty clay loam	Ponding Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table
95:	
Harps	Lime content Potential for ground-water contamination Seasonal high water table Wind erosion
107:	
Webster	Potential poor tilth and compaction Potential for ground-water contamination Seasonal high water table
108:	
Wadena	Excessive permeability Limited available water capacity Potential for ground-water contamination
108B:	
Wadena	Excessive permeability Limited available water capacity Potential for ground-water contamination
133:	
Colo	Flooding Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table
135:	
Coland	Flooding Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table

Table 5.--Cropland Management Considerations--Continued

Map symbol and component name	Cropland management considerations
138B:	
Clarion	Potential for surface-water contamination Water erosion
138C2:	
Clarion, moderately eroded	Potential for surface-water contamination Previously eroded Water erosion
175:	
Dickinson	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
175B:	
Dickinson	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
191:	
Rushmore	Potential poor tilth and compaction Potential for ground-water contamination Seasonal high water table
201B:	
Coland	Flooding Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table
Terril	Potential for surface-water contamination Water erosion
202:	
Cylinder, 24 to 32 inches to sand and gravel	Excessive permeability Potential for ground-water contamination Seasonal high water table
203:	
Cylinder, 32 to 40 inches to sand and gravel	Excessive permeability Potential for ground-water contamination Seasonal high water table
221:	
Klossner	High content of organic matter Ponding Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table Wind erosion
259:	
Biscay	Excessive permeability Potential for ground-water contamination Seasonal high water table

Table 5.--Cropland Management Considerations--Continued

Map symbol and component name	Cropland management considerations
274:	
Rolfe	Ponding Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table
282:	
Ransom	Potential poor tilth and compaction Potential for ground-water contamination Seasonal high water table
308:	
Wadena, 32 to 40 inches to sand and gravel	Excessive permeability Potential for ground-water contamination
308B:	
Wadena, 32 to 40 inches to sand and gravel	Excessive permeability Potential for ground-water contamination Potential for surface-water contamination Water erosion
354:	
Aquolls (marsh), ponded	Ponding Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table
375:	
Fostoria, lacustrine substratum	Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Seasonal high water table
376F:	
Cornell	Slope Potential poor tilth and compaction Potential for surface-water contamination Water erosion
379:	
Ocheyedan, lacustrine substratum	No major considerations
379B:	
Ocheyedan, lacustrine substratum	Potential for surface-water contamination Water erosion
379C2:	
Ocheyedan, lacustrine substratum, moderately eroded	Potential for surface-water contamination Previously eroded Water erosion
384:	
Collinwood	Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Seasonal high water table

Table 5.--Cropland Management Considerations--Continued

Map symbol and component name	Cropland management considerations
390:	
Waldorf	Potential poor tilth and compaction Potential for ground-water contamination Seasonal high water table
397:	
Letri	Potential poor tilth and compaction Potential for ground-water contamination Seasonal high water table
433E:	
Moneta	Slope Lime content Potential for surface-water contamination Water erosion Wind erosion
433F:	
Moneta	Slope Lime content Potential for surface-water contamination Water erosion Wind erosion
433G:	
Moneta	Slope Lime content Potential for surface-water contamination Water erosion Wind erosion
455:	
Wilmonton	Potential poor tilth and compaction Potential for ground-water contamination Seasonal high water table
456:	
Wilmonton	Potential poor tilth and compaction Potential for ground-water contamination Seasonal high water table
485:	
Spillville	Flooding Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table
506:	
Wacousta	Ponding Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table
507:	
Canisteo	Lime content Potential poor tilth and compaction Potential for ground-water contamination Seasonal high water table Wind erosion

Table 5.--Cropland Management Considerations--Continued

Map symbol and component name	Cropland management considerations
541C:	
Estherville	Excessive permeability Limited available water capacity Limited content of organic matter Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Hawick	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Wind erosion
559:	
Talcot	Excessive permeability Lime content Potential poor tilth and compaction Potential for ground-water contamination Seasonal high water table Wind erosion
577B:	
Everly	Potential poor tilth and compaction Potential for surface-water contamination Water erosion
577C2:	
Everly, moderately eroded	Potential poor tilth and compaction Potential for surface-water contamination Previously eroded Water erosion
637D2:	
Everly, moderately eroded	Potential poor tilth and compaction Potential for surface-water contamination Previously eroded Water erosion
Moneta, moderately eroded	Lime content Potential for surface-water contamination Previously eroded Water erosion
638C2:	
Clarion, moderately eroded	Potential for surface-water contamination Previously eroded Water erosion
Storden, moderately eroded	Lime content Potential for surface-water contamination Previously eroded Water erosion Wind erosion
672:	
May City	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion

Table 5.--Cropland Management Considerations--Continued

Map symbol and component name	Cropland management considerations
672B:	
May City	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
672C2:	
May City, moderately eroded	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion Wind erosion
709:	
Fairhaven	Excessive permeability Potential for ground-water contamination
733:	
Calco	Flooding Lime content Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table Wind erosion
735:	
Havelock	Flooding Lime content Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table Wind erosion
740D:	
Hawick	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
810:	
Galva, terrace	Potential poor tilth and compaction
810B:	
Galva, terrace	Potential poor tilth and compaction Potential for surface-water contamination Water erosion
828B:	
Zenor	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion

Table 5.--Cropland Management Considerations--Continued

Map symbol and component name	Cropland management considerations
828C2:	
Zenor, moderately eroded	Excessive permeability Limited available water capacity Limited content of organic matter Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion Wind erosion
835D2:	
Storden, moderately eroded	Lime content Potential for surface-water contamination Previously eroded Water erosion Wind erosion
Omsrud, moderately eroded	Lime content Potential for surface-water contamination Previously eroded Water erosion Wind erosion
835E2:	
Storden, moderately eroded	Slope Lime content Potential for surface-water contamination Previously eroded Water erosion Wind erosion
Omsrud, moderately eroded	Slope Lime content Potential for surface-water contamination Previously eroded Water erosion Wind erosion
854D:	
Histosols, fens	Slope Potential for ground-water contamination Seasonal high water table
874:	
Dickinson, lacustrine substratum	Excessive permeability Limited available water capacity Potential for ground-water contamination
874B:	
Dickinson, lacustrine substratum	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion

Table 5.--Cropland Management Considerations--Continued

Map symbol and component name	Cropland management considerations
874C2:	
Dickinson, lacustrine substratum, moderately eroded	Excessive permeability Limited available water capacity Limited content of organic matter Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion
875:	
Roine	Potential for ground-water contamination Wind erosion
875B:	
Roine	Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
875C2:	
Roine, moderately eroded	Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion Wind erosion
878:	
Ocheyedan	No major considerations
878B:	
Ocheyedan	Potential for surface-water contamination Water erosion
879:	
Fostoria	Potential for ground-water contamination Seasonal high water table
928:	
Annieville	Potential poor tilth and compaction
928B:	
Annieville	Potential poor tilth and compaction Potential for surface-water contamination Water erosion
992:	
Gillett Grove	Ponding Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table
1053:	
Belmann, gypsum phase	Potential for ground-water contamination Seasonal high water table
1091:	
McCreath	Potential poor tilth and compaction Potential for ground-water contamination Seasonal high water table

Table 5.--Cropland Management Considerations--Continued

Map symbol and component name	Cropland management considerations
1092:	
Gillett Grove	Potential poor tilth and compaction Potential for ground-water contamination Seasonal high water table
1133:	
Colo	Flooding Channels Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table
1259:	
Biscay, depressional	Excessive permeability Ponding Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table
1385:	
Ocheda	Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Seasonal high water table
1508:	
Belmann	Potential for ground-water contamination Seasonal high water table
1585:	
Spillville	Flooding Channels Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table
Coland	Flooding Channels Potential poor tilth and compaction Potential for ground-water contamination Potential for surface-water contamination Seasonal high water table
5010:	
Pits, sand and gravel	Not applicable
5040:	
Udorthents, loamy	Not applicable
5060:	
Pits, clay	Not applicable
AW:	
Animal waste	Not applicable
SL:	
Sewage lagoon	Not applicable
W:	
Water	Not applicable

Table 6.--Land Capability, Corn Suitability Rating, Subsoil Nutrients, and Yields per Acre of Crops

(Yields are those that can be expected under a high level of management. They are for nonirrigated areas. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. See text for an explanation of terms used in this table)

Map symbol and component name	Land capability	Corn suitability rating	Subsoil phosphorus	Subsoil potassium	Corn	Oats	Soybeans
					Bu	Bu	Bu
6----------------------- Okoboji	3w	55	Very low	Very low	109	76	35
27B--------------------- Terril	2e	75	Very low	Very low	133	93	43
27C--------------------- Terril	3e	61	Very low	Very low	128	90	41
27D--------------------- Terril	3e	52	Very low	Very low	119	83	38
31---------------------- Afton	2w	75	Low	Low	135	101	51
34B--------------------- Estherville	3s	19	Low	Low	50	35	16
41C--------------------- Sparta	6s	5	Very low	Very low	---	32	---
48---------------------- Knoke	3w	54	Very low	Very low	103	72	33
54---------------------- Zook	2w	68	Low	Low	122	85	39
55---------------------- Nicollet	1	82	Very low	High	142	99	45
62F--------------------- Storden	6e	11	Very low	Very low	---	---	---
77B--------------------- Sac	2e	71	Low	Low	125	94	47
77C--------------------- Sac	3e	55	Low	Low	118	88	44
77C2-------------------- Sac, moderately eroded	3e	53	Low	Low	115	86	43
90---------------------- Okoboji mucky silty clay loam	3w	57	Very low	Very low	113	79	36
95---------------------- Harps	2w	57	Very low	Very low	113	79	36
107--------------------- Webster	2w	77	Very low	Very low	131	92	42
108--------------------- Wadena	2s	52	Very low	Very low	94	66	30
108B-------------------- Wadena	2s	47	Very low	Very low	2	63	29

Table 6.--Land Capability, Corn Suitability Rating, Subsoil Nutrients, and Yields per Acre of Crops--Continued

Map symbol and component name	Land capability	Corn suitability rating	Subsoil phosphorus	Subsoil potassium	Corn	Oats	Soybeans
					Bu	Bu	Bu
133	2w	73	Very low	Medium	125	93	47
Colo							
135	2w	78	Low	Very low	124	87	40
Coland							
138B	2e	74	Very low	Very low	131	92	42
Clarion							
138C2	3e	59	Very low	Very low	122	85	39
Clarion, moderately eroded							
175	3s	41	Very low	Very low	76	53	24
Dickinson							
175B	3e	36	Very low	Very low	73	51	23
Dickinson							
191	2w	76	Low	Low	137	96	51
Rushmore							
201B		51	Very low	Very low	122	85	39
Coland	2w						
Terril	2e						
202	2s	60	Low	Low	107	75	34
Cylinder, 24 to 32 inches to sand and gravel							
203	2s	71	Very low	Very low	124	87	40
Cylinder, 32 to 40 inches to sand and gravel							
221	3w	48	Very low	Very low	110	77	35
Klossner							
259	2w	70	Very low	Very low	119	83	38
Biscay							
274	3w	48	Low	High	95	67	30
Rolfe							
282	1	81	Low	Low	139	97	52
Ransom							
308	2s	65	Very low	Very low	109	76	35
Wadena, 32 to 40 inches to sand and gravel							
308B	2e	60	Very low	Very low	102	71	33
Wadena, 32 to 40 inches to sand and gravel							
354	5w	5	---	---	---	---	---
Aquolls (marsh), ponded							
375	2e	70	Low	Low	124	87	40
Fostoria, lacustrine substratum							

Table 6.--Land Capability, Corn Suitability Rating, Subsoil Nutrients, and Yields per Acre of Crops--Continued

Map symbol and component name	Land capability	Corn suitability rating	Subsoil phosphorus	Subsoil potassium	Corn	Oats	Soybeans
					Bu	Bu	Bu
376F--------------------- Cornell	6e	16	Low	Low	---	---	---
379--------------------- Ocheyedan, lacustrine substratum	2w	67	Low	Low	118	83	38
379B-------------------- Ocheyedan, lacustrine substratum	2e	62	Low	Low	117	82	37
379C2------------------- Ocheyedan, lacustrine substratum, moderately eroded	3e	47	Low	Low	97	68	31
384--------------------- Collinwood	2e	67	Low	Low	114	80	36
390--------------------- Waldorf	2w	63	Low	Low	101	62	32
397--------------------- Letri	2w	72	Low	Low	137	96	44
433E-------------------- Moneta	4e	25	Low	Low	71	50	23
433F-------------------- Moneta	6e	5	Low	Low	---	---	---
433G-------------------- Moneta	7e	5	Low	Low	---	---	---
455--------------------- Wilmonton	1	74	Low	Low	128	90	41
456--------------------- Wilmonton	1	75	Low	Low	130	91	42
485--------------------- Spillville	2w	75	Very low	Very low	135	95	43
506--------------------- Wacousta	3w	69	Low	Low	113	79	36
507--------------------- Canisteo	2w	73	Very low	Very low	127	89	41
541C---------------------		5	Low	Low	50	35	16
Estherville-------------	3s						
Hawick------------------	4s						
559--------------------- Talcot	2w	65	Low	Low	113	79	36
577B-------------------- Everly	2e	68	Low	Low	127	89	41
577C2------------------- Everly, moderately eroded	3e	51	Low	Low	115	81	37

Table 6.--Land Capability, Corn Suitability Rating, Subsoil Nutrients, and Yields per Acre of Crops--Continued

Map symbol and component name	Land capability	Corn suitability rating	Subsoil phosphorus	Subsoil potassium	Corn	Oats	Soybeans
					Bu	Bu	Bu
637D2--------------------- Everly-Moneta	3e	37	Low	Low	98	69	31
638C2--------------------- Clarion-Storden	3e	55	Very low	Very low	123	86	39
672--------------------- May City	4s	38	Low	Low	52	31	17
672B--------------------- May City	3s	33	Low	Low	49	29	16
672C2--------------------- May City, moderately eroded	3s	18	Low	Low	44	26	13
709--------------------- Fairhaven	1	63	Low	Low	106	80	40
733--------------------- Calco	2w	68	Low	Low	116	87	44
735--------------------- Havelock	2w	68	Low	Low	116	81	37
740D--------------------- Hawick	4s	5	Low	Low	---	---	---
810--------------------- Galva, terrace	1	78	Low	Low	132	99	50
810B--------------------- Galva, terrace	2e	73	Low	Low	129	97	48
828B--------------------- Zenor	3e	45	Very low	Very low	89	62	28
828C2--------------------- Zenor, moderately eroded	3e	30	Very low	Very low	81	57	26
835D2--------------------- Storden-Omsrud	3e	46	Low	Low	120	84	38
835E2--------------------- Storden-Omsrud	4e	36	Low	Low	106	74	34
854D--------------------- Histosols, fens	5w	5	---	---	---	---	---
874--------------------- Dickinson, lacustrine substratum	1	46	Low	Low	120	84	38
874B--------------------- Dickinson, lacustrine substratum	2e	41	Low	Low	116	81	37
874C2--------------------- Dickinson, lacustrine substratum, moderately eroded	3e	21	Low	Low	110	77	35

Table 6.--Land Capability, Corn Suitability Rating, Subsoil Nutrients, and Yields per Acre of Crops--Continued

Map symbol and component name	Land capability	Corn suitability rating	Subsoil phosphorus	Subsoil potassium	Corn	Oats	Soybeans
					Bu	Bu	Bu
875----------------------- Roine	3s	46	Low	Low	119	83	38
875B---------------------- Roine	3e	41	Low	Low	116	81	37
875C2--------------------- Roine, moderately eroded	3e	21	Low	Low	108	75	35
878----------------------- Ocheyedan	1	69	Low	Low	122	85	37
878B---------------------- Ocheyedan	2e	63	Low	Low	119	83	38
879----------------------- Fostoria	1	72	Low	Low	128	90	41
928----------------------- Annieville	1	78	Low	Low	137	96	51
928B---------------------- Annieville	2e	73	Low	Low	134	94	50
992----------------------- Gillett Grove	3w	58	Low	Low	115	81	37
1053---------------------- Belmann, gypsum phase	2e	69	Low	Low	120	85	40
1091---------------------- McCreath	1	83	Low	Low	145	102	54
1092---------------------- Gillett Grove	2w	78	Low	Low	140	98	53
1133---------------------- Colo	5w	25	Low	Low	---	---	---
1259---------------------- Biscay, depressional	3w	49	Low	Low	103	72	33
1385---------------------- Ocheda	2w	73			120	90	45
1508---------------------- Belmann	2e	64	Low	Low	120	84	45
1585---------------------- Spillville-Coland	5w	25	Very low	Very low	---	---	---
4000. Urban land							
5010---------------------- Pits, sand and gravel	6s	---	---	---	---	---	---
5040. Udorthents, loamy							
5060. Pits, clay							

Table 6.--Land Capability, Corn Suitability Rating, Subsoil Nutrients, and Yields per Acre of Crops--Continued

Map symbol and component name	Land capability	Corn suitability rating	Subsoil phosphorus	Subsoil potassium	Corn	Oats	Soybeans
					Bu	Bu	Bu
AW.							
Animal waste							
SL.							
Sewage lagoon							
W.							
Water							

Table 7.--Land Capability and Yields per Acre of Pasture

(Yields are those that can be expected under a high level of management. They are for nonirrigated areas. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and component name	Land capability	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		Tons	AUM*	AUM*
6----------------------- Okoboji	3w	3.3	2.7	4.5
27B--------------------- Terril	2e	5.6	3.3	5.5
27C--------------------- Terril	3e	5.4	3.2	5.3
27D--------------------- Terril	3e	5.0	2.9	4.9
31---------------------- Afton	2w	4.1	3.3	5.5
34B--------------------- Estherville	3s	1.7	1.0	1.7
41C--------------------- Sparta	6s	1.9	0.6	1.1
48---------------------- Knoke	3w	3.1	2.5	4.2
54---------------------- Zook	2w	3.7	3.0	5.0
55---------------------- Nicollet	1	5.7	3.5	5.8
62F--------------------- Storden	6e	---	1.8	3.1
77B--------------------- Sac	2e	5.3	3.1	4.9
77C--------------------- Sac	3e	4.9	2.9	4.9
77C2-------------------- Sac, moderately eroded	3e	4.8	2.8	4.7
90---------------------- Okoboji mucky silty clay loam	3w	3.4	2.8	4.6
95---------------------- Harps	2w	3.4	2.8	4.6
107--------------------- Webster	2w	3.9	3.2	5.4

See footnote at end of table.

Table 7.--Land Capability and Yields per Acre of Pasture--Continued

Map symbol and component name	Land capability	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		Tons	AUM*	AUM*
108	2s	3.9	2.3	3.9
Wadena				
108B	2s	3.7	2.1	3.6
Wadena				
133	2w	3.8	3.1	5.1
Colo				
135	2w	3.7	3.1	5.1
Coland				
138B	2e	5.5	3.2	5.4
Clarion				
138C2	3e	5.1	3.0	5.0
Clarion, moderately eroded				
175	3s	3.2	1.9	3.1
Dickinson				
175B	3e	3.1	1.8	3.0
Dickinson				
191	2w	4.1	3.4	5.6
Rushmore				
201B		3.0	3.0	5.0
Coland	2w			
Terril	2e			
202	2s	4.4	2.7	4.5
Cylinder, 24 to 32 inches to sand and gravel				
203	2s	4.9	3.0	5.0
Cylinder, 32 to 40 inches to sand and gravel				
221	3w	3.3	2.7	4.5
Klossner				
259	2w	3.6	2.9	4.9
Biscay				
274	3w	2.8	2.4	4.0
Rolfe				
282	1	5.6	3.4	5.6
Ransom				
308	2s	4.6	2.7	4.5
Wadena, 32 to 40 inches to sand and gravel				
308B	2e	4.3	2.6	4.2
Wadena, 32 to 40 inches to sand and gravel				

See footnote at end of table.

Table 7.--Land Capability and Yields per Acre of Pasture--Continued

Map symbol and component name	Land capability	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		Tons	AUM*	AUM*
354	5w	---	---	---
Aquolls (marsh), ponded				
375	2e	4.9	2.6	4.8
Fostoria, lacustrine substratum				
376F	6e	---	2.0	3.4
Cornell				
379	2w	4.9	2.6	4.8
Ocheyedan, lacustrine substratum				
379B	2e	4.7	2.5	4.6
Ocheyedan, lacustrine substratum				
379C2	3e	4.5	2.3	4.4
Ocheyedan, lacustrine substratum, moderately eroded				
384	2e	4.5	2.7	4.7
Collinwood				
390	2w	3.0	2.5	4.1
Waldorf				
397	2w	4.1	3.3	5.6
Letri				
433E	4e	3.0	2.2	3.6
Moneta				
433F	6e	2.5	2.0	2.0
Moneta				
433G	7e	---	1.5	---
Moneta				
455	1	5.1	3.4	5.3
Wilmonton				
456	1	5.1	3.4	5.3
Wilmonton				
485	2w	5.4	3.4	5.5
Spillville				
506	3w	3.5	2.9	4.8
Wacousta				
507	2w	3.8	3.1	5.2
Canisteo				
541C		2.2	1.4	2.3
Estherville	3s			
Hawick	4s			

See footnote at end of table.

Table 7.--Land Capability and Yields per Acre of Pasture--Continued

Map symbol and component name	Land capability	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		Tons	AUM*	AUM*
559-- Talcot	2w	3.4	2.8	4.6
577B-- Everly	2e	5.3	2.7	3.2
577C2-- Everly, moderately eroded	3e	4.7	2.7	4.6
637D2-- Everly-Moneta	3e	4.3	2.5	4.2
638C2-- Clarion-Storden	3e	4.9	3.0	4.7
672-- May City	4s	2.2	1.3	2.2
672B-- May City	3s	2.1	1.2	2.0
672C2-- May City, moderately eroded	3s	1.8	1.1	1.8
709-- Fairhaven	1	4.6	2.7	4.5
733-- Calco	2w	3.4	2.8	4.7
735-- Havelock	2w	3.4	2.8	4.7
740D-- Hawick	4s	1.7	1.2	2.0
810-- Galva, terrace	1	5.5	3.7	5.8
810B-- Galva, terrace	2e	5.4	3.7	5.7
828B-- Zenor	3e	3.7	2.2	3.6
828C2-- Zenor, moderately eroded	3e	3.4	2.0	3.3
835D2-- Storden-Omsrud	3e	5.0	3.0	4.9
835E2-- Storden-Omsrud	4e	4.2	2.5	4.1
854D-- Histosols, fens	5w	---	---	---

See footnote at end of table.

Table 7.--Land Capability and Yields per Acre of Pasture--Continued

Map symbol and component name	Land capability	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		Tons	AUM*	AUM*
874---------------------- Dickinson, lacustrine substratum	1	4.7	3.7	4.5
874B--------------------- Dickinson, lacustrine substratum	2e	4.9	3.7	4.4
874C2-------------------- Dickinson, lacustrine substratum, moderately eroded	3e	4.2	3.3	4.2
875---------------------- Roine	3s	5.0	2.9	4.9
875B--------------------- Roine	3e	4.9	2.9	4.8
875C2-------------------- Roine, moderately eroded	3e	4.5	2.7	4.4
878---------------------- Ocheyedan	1	5.1	2.7	5.0
878B--------------------- Ocheyedan	2e	5.0	2.6	4.9
879---------------------- Fostoria	1	5.1	3.2	5.3
928---------------------- Annieville	1	5.7	3.2	5.6
928B--------------------- Annieville	2e	5.6	3.1	6.5
992---------------------- Gillett Grove	3w	3.5	2.8	4.7
1053--------------------- Belmann, gypsum phase	2e	4.7	3.7	6.2
1091--------------------- McCreath	1	5.8	3.6	5.9
1092--------------------- Gillett Grove	2w	4.2	3.4	5.7
1133--------------------- Colo	5w	---	2.0	---
1259--------------------- Biscay, depressional	3w	3.1	2.6	4.3
1385--------------------- Ocheda	2w	4.6	2.7	4.5
1508--------------------- Belmann	2e	3.6	2.8	4.7

See footnote at end of table.

Table 7.--Land Capability and Yields per Acre of Pasture--Continued

Map symbol and component name	Land capability	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass
		Tons	AUM*	AUM*
1585. Spillville-Coland	5w	---	2.9	---
5010. Pits, sand and gravel	6s	---	---	---
5040. Udorthents, loamy				
5060. Pits, clay				
AW. Animal waste				
SL. Sewage lagoon				
W. Water				

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five goats, or five sheep) for 30 days.

Table 8.--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
27B	Terril loam, 2 to 5 percent slopes
31	Afton silty clay loam, 0 to 2 percent slopes (where drained)
54	Zook silty clay loam, 0 to 2 percent slopes, occasionally flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
55	Nicollet loam, 1 to 3 percent slopes
77B	Sac silty clay loam, 2 to 5 percent slopes
95	Harps loam, 0 to 2 percent slopes (where drained)
107	Webster silty clay loam, 0 to 2 percent slopes (where drained)
108	Wadena loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes
108B	Wadena loam, 24 to 32 inches to sand and gravel, 2 to 5 percent slopes
133	Colo silty clay loam, 0 to 2 percent slopes, occasionally flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
135	Coland clay loam, 0 to 2 percent slopes, occasionally flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
138B	Clarion loam, 2 to 5 percent slopes
175	Dickinson fine sandy loam, 0 to 2 percent slopes
175B	Dickinson fine sandy loam, 2 to 5 percent slopes
191	Rushmore silty clay loam, 0 to 2 percent slopes (where drained)
201B	Coland-Terril complex, 1 to 5 percent slopes (where drained)
202	Cylinder loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes
203	Cylinder loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes
259	Biscay clay loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes (where drained)
282	Ransom silty clay loam, 1 to 3 percent slopes
308	Wadena loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes
308B	Wadena loam, 32 to 40 inches to sand and gravel, 2 to 5 percent slopes
375	Fostoria clay loam, lacustrine substratum, 1 to 3 percent slopes
379	Ocheyedan clay loam, lacustrine substratum, 0 to 2 percent slopes
379B	Ocheyedan clay loam, lacustrine substratum, 2 to 5 percent slopes
384	Collinwood clay, 1 to 3 percent slopes
390	Waldorf silty clay, 0 to 2 percent slopes (where drained)
397	Letri clay loam, 0 to 2 percent slopes (where drained)
455	Wilmonton clay loam, 1 to 3 percent slopes
456	Wilmonton silty clay loam, 1 to 3 percent slopes
485	Spillville loam, 0 to 2 percent slopes, occasionally flooded (where protected from flooding or not frequently flooded during the growing season)
507	Canisteo clay loam, 0 to 2 percent slopes (where drained)
559	Talcot clay loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes (where drained)
577B	Everly clay loam, 2 to 5 percent slopes
709	Fairhaven silt loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes
733	Calco silty clay loam, 0 to 2 percent slopes, occasionally flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
735	Havelock clay loam, 0 to 2 percent slopes, occasionally flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
810	Galva silty clay loam, terrace, 0 to 2 percent slopes
810B	Galva silty clay loam, terrace, 2 to 5 percent slopes
874	Dickinson sandy loam, lacustrine substratum, 0 to 2 percent slopes
874B	Dickinson sandy loam, lacustrine substratum, 2 to 5 percent slopes
875	Roine fine sandy loam, 0 to 2 percent slopes
875B	Roine fine sandy loam, 2 to 5 percent slopes
878	Ocheyedan loam, 0 to 2 percent slopes
878B	Ocheyedan loam, 2 to 5 percent slopes
879	Fostoria loam, 1 to 3 percent slopes
928	Annieville silty clay loam, 0 to 2 percent slopes
928B	Annieville silty clay loam, 2 to 5 percent slopes
1053	Belmann clay loam, gypsum phase, 0 to 2 percent slopes (where drained)
1091	McCreath silty clay loam, 0 to 2 percent slopes
1092	Gillett Grove silty clay loam, 0 to 2 percent slopes (where drained)
1385	Ocheda silty clay loam, 1 to 3 percent slopes
1508	Belmann clay loam, 0 to 2 percent slopes (where drained)

Table 9.--Windbreaks and Environmental Plantings

(Only the soils that are suitable for windbreaks and environmental plantings are listed. Absence of an entry indicates that trees generally do not grow to the given height)

Map symbol and component name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
6:					
Okoboji	Redosier dogwood	---	Black ash, tall purple willow	Black willow, golden willow, white willow	---
27B:					
Terril	---	Siberian peashrub, common lilac, gray dogwood, redosier dogwood	Eastern arborvitae, eastern redcedar, Amur maple, blue spruce	Russian-olive, green ash, honeylocust, eastern white pine	---
27C:					
Terril	---	Siberian peashrub, common lilac, gray dogwood, redosier dogwood	Eastern arborvitae, eastern redcedar, Amur maple, blue spruce	Russian-olive, honeylocust, eastern white pine, green ash	---
27D:					
Terril	---	Siberian peashrub, common lilac, gray dogwood, redosier dogwood	Eastern arborvitae, eastern redcedar, Amur maple, blue spruce	Russian-olive, honeylocust, eastern white pine, green ash	---
31:					
Afton	Siberian peashrub, common lilac	---	Eastern redcedar, Russian-olive, blue spruce, common hackberry, ponderosa pine	Golden willow, green ash, honeylocust	Eastern cottonwood
34B:					
Estherville	Siberian peashrub, common lilac	Eastern redcedar	Russian-olive, jack pine, red pine, Austrian pine, Siberian elm, green ash, honeylocust	Eastern white pine	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and component name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
41C:					
Sparta	Siberian peashrub, common lilac	---	Russian-olive, eastern redcedar, jack pine, red pine, Austrian pine, Siberian elm, green ash, honeylocust	Eastern white pine	---
48:					
Knoke	---	Siberian peashrub, common lilac, cotoneaster, eastern arborvitae	Eastern redcedar, bur oak, white spruce, common hackberry	Green ash, golden willow, honeylocust	Eastern cottonwood
54:					
Zook	Silky dogwood	American cranberrybush, Amur honeysuckle, Amur privet	Washington hawthorn, blue spruce, white fir, eastern arborvitae, Austrian pine	Norway spruce, eastern white pine	Pin oak
55:					
Nicollet	---	Common lilac, redosier dogwood	Eastern arborvitae, white spruce, Amur maple, blue spruce	Austrian pine, eastern white pine, common hackberry, green ash	Silver maple
62F:					
Storden	American plum, Siberian peashrub	Common hackberry, eastern redcedar	Russian-olive, green ash, honeylocust	Siberian elm	---
77B:					
Sac	Common lilac	American plum, Siberian peashrub	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---
77C:					
Sac	Common lilac	American plum, Siberian peashrub	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and component name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
77C2:					
Sac, moderately eroded	Common lilac	American plum, Siberian peashrub	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---
90:					
Okoboji mucky silty clay loam	Redosier dogwood	---	Black ash, tall purple willow	Black willow, golden willow, white willow	---
95:					
Harps	---	Siberian peashrub, common lilac, eastern arborvitae	Eastern redcedar, bur oak, white spruce, common hackberry	Green ash, golden willow, honeylocust	Eastern cottonwood
107:					
Webster	---	American plum, cotoneaster, redosier dogwood	Amur maple, eastern arborvitae, white spruce, common hackberry, tall purple willow	Golden willow	Green ash, silver maple, eastern cottonwood
108:					
Wadena	Siberian peashrub, common lilac	Eastern redcedar	Manchurian crabapple, Russian-olive, bur oak, common hackberry, green ash, eastern white pine, jack pine	---	---
108B:					
Wadena	Siberian peashrub, common lilac	Eastern redcedar	Manchurian crabapple, Russian-olive, bur oak, common hackberry, green ash, eastern white pine, jack pine	---	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and component name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
133:					
Colo	---	American plum	Amur maple, redosier dogwood, white fir, white spruce, common hackberry, tall purple willow	Golden willow	Green ash, silver maple, eastern cottonwood
135:					
Coland	Silky dogwood	American cranberrybush, Amur honeysuckle, Amur privet	Washington hawthorn, blue spruce, white fir, eastern arborvitae, Austrian pine	Norway spruce, eastern white pine	Pin oak
138B:					
Clarion	---	Siberian peashrub, common lilac, gray dogwood, redosier dogwood	Eastern arborvitae, eastern redcedar, Amur maple, blue spruce	Russian-olive, common hackberry, green ash, eastern white pine	---
138C2:					
Clarion, moderately eroded	---	Siberian peashrub, common lilac, gray dogwood, redosier dogwood	Eastern arborvitae, eastern redcedar, Amur maple, blue spruce	Russian-olive, common hackberry, green ash, eastern white pine	---
175:					
Dickinson	Common lilac	Siberian peashrub, Russian-olive, eastern redcedar	Amur maple, common hackberry, red pine, eastern white pine, green ash	Norway spruce, honeylocust	---
175B:					
Dickinson	Common lilac	Siberian peashrub, Russian-olive, eastern redcedar	Amur maple, common hackberry, red pine, eastern white pine, green ash	Norway spruce, honeylocust	---
191:					
Rushmore	Siberian peashrub, common lilac	---	Eastern redcedar, blue spruce, common hackberry, ponderosa pine	Golden willow, green ash, honeylocust, silver maple	Eastern cottonwood

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and component name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
201B:					
Coland	Silky dogwood	American cranberrybush, Amur honeysuckle, Amur privet	Washington hawthorn, blue spruce, white fir, eastern arborvitae, Austrian pine	Norway spruce, eastern white pine	Pin oak
Terril	---	Siberian peashrub, common lilac, gray dogwood, redosier dogwood	Eastern arborvitae, eastern redcedar, Amur maple, blue spruce	Russian-olive, green ash, honeylocust, eastern white pine	---
202:					
Cylinder, 24 to 32 inches to sand and gravel	---	Common lilac, redosier dogwood	Eastern arborvitae, white spruce, Amur maple, blue spruce	Austrian pine, eastern white pine, common hackberry, green ash	Silver maple
203:					
Cylinder, 32 to 40 inches to sand and gravel	---	Common lilac, redosier dogwood	Eastern arborvitae, white spruce, Amur maple, blue spruce	Austrian pine, eastern white pine, common hackberry, green ash	Silver maple
221:					
Klossner	Common ninebark, silky dogwood, whitebelle honeysuckle	Amur honeysuckle, Amur privet, nannyberry	Tall purple willow	Black willow, golden willow	Imperial Carolina poplar
259:					
Biscay	---	American plum, cotoneaster, redosier dogwood	Amur maple, eastern arborvitae, white spruce, common hackberry, tall purple willow	Golden willow	Green ash, silver maple, eastern cottonwood
274:					
Rolfe	---	American plum, redosier dogwood	Amur maple, eastern arborvitae, white spruce, common hackberry, tall purple willow	Golden willow	Green ash, silver maple, eastern cottonwood

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and component name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
282:					
Ransom	Peking cotoneaster	American plum, Siberian peashrub, common lilac	Manchurian crabapple, eastern redcedar, ponderosa pine	Common hackberry, green ash, honeylocust, golden willow	Eastern cottonwood
308:					
Wadena, 32 to 40 inches to sand and gravel	Siberian peashrub, common lilac	Manchurian crabapple, Russian-olive, common hackberry, eastern redcedar	Bur oak, green ash, eastern white pine, jack pine	---	---
308B:					
Wadena, 32 to 40 inches to sand and gravel	Siberian peashrub, common lilac	Manchurian crabapple, Russian-olive, common hackberry, eastern redcedar	Bur oak, green ash, eastern white pine, jack pine	---	---
375:					
Fostoria, lacustrine substratum	---	Common lilac, redosier dogwood	Eastern arborvitae, white spruce, Amur maple, blue spruce	Austrian pine, eastern white pine, common hackberry, green ash	Silver maple
376F:					
Cornell	Amur honeysuckle, common lilac	Amur maple, autumn-olive	Russian-olive, bur oak, common hackberry, eastern redcedar	Austrian pine, eastern white pine, green ash, honeylocust	---
379:					
Ocheyedan, lacustrine substratum	Common lilac	American plum, Siberian peashrub	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---
379B:					
Ocheyedan, lacustrine substratum	Common lilac	American plum, Siberian peashrub	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and component name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
379C2: Ocheyedan, lacustrine substratum, moderately eroded	Common lilac	American plum, Siberian peashrub	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---
384: Collinwood	---	Siberian peashrub, common lilac, cotoneaster, eastern arborvitae	Bur oak, eastern redcedar, white spruce, Austrian pine, Russian-olive, common hackberry	Eastern white pine, green ash	---
390: Waldorf	---	Redosier dogwood	American plum, Amur maple, eastern arborvitae, white spruce, common hackberry, tall purple willow	---	Golden willow, green ash, silver maple, eastern cottonwood
397: Letri	Siberian peashrub, common lilac	---	Eastern redcedar, blue spruce, common hackberry, ponderosa pine	Golden willow, green ash, honeylocust, silver maple	Eastern cottonwood
433E: Moneta	American plum, Siberian peashrub	---	Russian-olive, common hackberry, eastern redcedar, green ash, honeylocust	Siberian elm	---
433F: Moneta	American plum, Siberian peashrub	---	Russian-olive, common hackberry, eastern redcedar, green ash, honeylocust	Siberian elm	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and component name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
433G:					
Moneta	American plum, Siberian peashrub	---	Russian-olive, common hackberry, eastern redcedar, green ash, honeylocust	Siberian elm	---
455:					
Wilmonton	Peking cotoneaster	American plum, Siberian peashrub, common lilac	Manchurian crabapple, eastern redcedar, ponderosa pine	Common hackberry, green ash, honeylocust, golden willow	Eastern cottonwood
456:					
Wilmonton	Peking cotoneaster	American plum, Siberian peashrub, common lilac	Manchurian crabapple, eastern redcedar, ponderosa pine	Common hackberry, green ash, honeylocust, golden willow	Eastern cottonwood
485:					
Spillville	Silky dogwood	American cranberrybush, Amur honeysuckle, Amur privet	Washington hawthorn, blue spruce, eastern arborvitae, white fir	Austrian pine, Norway spruce	Pin oak, eastern white pine
506:					
Wacousta	---	Siberian peashrub, common lilac, eastern arborvitae	Eastern redcedar, bur oak, white spruce, common hackberry	Green ash, golden willow, honeylocust	Eastern cottonwood
507:					
Canisteo	---	Cotoneaster, Washington hawthorn, nannyberry	White spruce, eastern arborvitae, eastern redcedar, green ash, osageorange	Black willow	---
541C:					
Estherville	Siberian peashrub, common lilac	Eastern redcedar	Russian-olive, jack pine, red pine, Austrian pine, Siberian elm, green ash, honeylocust	Eastern white pine	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and component name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
541C:					
Hawick	Siberian peashrub, honeysuckle, late lilac	---	Austrian pine, Russian-olive, eastern redcedar, green ash, jack pine, thornless honeylocust	Siberian elm, eastern white pine, red pine	---
559:					
Talcot	Siberian peashrub, common lilac	---	Eastern redcedar, Russian-olive, blue spruce, common hackberry, ponderosa pine	Golden willow, green ash, honeylocust	Eastern cottonwood
577B:					
Everly	Common lilac	American plum, Siberian peashrub, cotoneaster	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---
577C2:					
Everly, moderately eroded	Common lilac	American plum, Siberian peashrub, cotoneaster	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---
637D2:					
Everly, moderately eroded	Common lilac	American plum, Siberian peashrub, cotoneaster	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---
Moneta, moderately eroded	Common lilac	American plum, Siberian peashrub, cotoneaster	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---
638C2:					
Clarion, moderately eroded	---	Siberian peashrub, common lilac, gray dogwood, redosier dogwood	Eastern arborvitae, eastern redcedar, Amur maple, blue spruce	Russian-olive, common hackberry, green ash, eastern white pine	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and component name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
638C2:					
Storden, moderately eroded	American plum, Siberian peashrub	Common hackberry, eastern redcedar	Russian-olive, green ash, honeylocust	Siberian elm	---
672:					
May City	Siberian peashrub, gray dogwood, manyflower cotoneaster, silky dogwood	American cranberrybush, Amur maple, common lilac, eastern redcedar	Norway spruce	Eastern white pine, jack pine, red pine	---
672B:					
May City	Siberian peashrub, gray dogwood, manyflower cotoneaster, silky dogwood	American cranberrybush, Amur maple, common lilac, eastern redcedar	Norway spruce	Eastern white pine, jack pine, red pine	---
672C2:					
May City, moderately eroded	Siberian peashrub, gray dogwood, manyflower cotoneaster, silky dogwood	American cranberrybush, Amur maple, common lilac, eastern redcedar	Norway spruce	Eastern white pine, jack pine, red pine	---
733:					
Calco	Amur honeysuckle, Siberian peashrub, common lilac	---	Eastern redcedar, Russian-olive, common hackberry, ponderosa pine	Golden willow, green ash, honeylocust	Eastern cottonwood
735:					
Havelock	---	Siberian peashrub, common lilac, eastern arborvitae	Eastern redcedar, bur oak, white spruce, common hackberry	Green ash, golden willow, honeylocust	Eastern cottonwood
740D:					
Hawick	Siberian peashrub, honeysuckle, late lilac	---	Austrian pine, Russian-olive, eastern redcedar, green ash, jack pine, thornless honeylocust	Siberian elm, eastern white pine, red pine	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and component name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
810:					
Galva, terrace	Common lilac	American plum, Siberian peashrub	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---
810B:					
Galva, terrace	Common lilac	American plum, Siberian peashrub	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---
828B:					
Zenor	Siberian peashrub, common lilac	Manchurian crabapple, common hackberry, eastern redcedar	Russian-olive, bur oak, green ash, eastern white pine, jack pine, honeylocust	---	---
828C2:					
Zenor, moderately eroded	Siberian peashrub, common lilac	Manchurian crabapple, common hackberry, eastern redcedar	Russian-olive, bur oak, green ash, eastern white pine, jack pine, honeylocust	---	---
835D2:					
Storden, moderately eroded	American plum, Siberian peashrub	Common hackberry, eastern redcedar	Russian-olive, green ash, honeylocust	Siberian elm	---
Omsrud, moderately eroded	---	Siberian peashrub, common lilac, gray dogwood, redosier dogwood	Eastern arborvitae, eastern redcedar, Amur maple, blue spruce	Russian-olive, common hackberry, green ash, eastern white pine	---
835E2:					
Storden, moderately eroded	American plum, Siberian peashrub	---	Russian-olive, common hackberry, eastern redcedar, green ash, honeylocust	Siberian elm	---
Omsrud, moderately eroded	American plum, Siberian peashrub	Common hackberry, eastern redcedar	Russian-olive, green ash, honeylocust	Siberian elm	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and component name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
874:					
Dickinson, lacustrine substratum	Common lilac	Siberian peashrub, Russian-olive, eastern redcedar	Amur maple, common hackberry, red pine, eastern white pine, green ash	Norway spruce, honeylocust	---
874B:					
Dickinson, lacustrine substratum	Common lilac	Siberian peashrub, Russian-olive, eastern redcedar	Amur maple, common hackberry, red pine, eastern white pine, green ash	Norway spruce, honeylocust	---
874C2:					
Dickinson, lacustrine substratum, moderately eroded	Common lilac	Siberian peashrub, Russian-olive, eastern redcedar	Amur maple, common hackberry, red pine, eastern white pine, green ash	Norway spruce, honeylocust	---
875:					
Roine	Common lilac	Siberian peashrub, Russian-olive, eastern redcedar	Amur maple, common hackberry, red pine, eastern white pine, green ash	Norway spruce, honeylocust	---
875B:					
Roine	Common lilac	Siberian peashrub, Russian-olive, eastern redcedar	Amur maple, common hackberry, red pine, eastern white pine, green ash	Norway spruce, honeylocust	---
875C2:					
Roine, moderately eroded	Common lilac	Siberian peashrub, Russian-olive, eastern redcedar	Amur maple, common hackberry, red pine, eastern white pine, green ash	Norway spruce, honeylocust	---
878:					
Ocheyedan	Common lilac	American plum, Siberian peashrub	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and component name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
878B:					
Ocheyedan	Common lilac	American plum, Siberian peashrub	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---
879:					
Fostoria	---	Common lilac, redosier dogwood	Eastern arborvitae, white spruce, Amur maple, blue spruce	Austrian pine, eastern white pine, common hackberry, green ash	Silver maple
928:					
Annieville	Common lilac	American plum, Siberian peashrub	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---
928B:					
Annieville	Common lilac	American plum, Siberian peashrub	Bur oak, eastern redcedar, Russian-olive, blue spruce, common hackberry	Green ash, ponderosa pine, honeylocust	---
992:					
Gillett Grove	Redosier dogwood	---	Black ash, tall purple willow	Black willow, golden willow, white willow	---
1053:					
Belmann, gypsum phase	---	Siberian peashrub, common lilac, cotoneaster, eastern arborvitae	Eastern redcedar, bur oak, white spruce, common hackberry	Green ash, golden willow, honeylocust	Eastern cottonwood
1091:					
McCreath	Peking cotoneaster	American plum, Siberian peashrub, common lilac	Manchurian crabapple, eastern redcedar, ponderosa pine	Common hackberry, golden willow, green ash, honeylocust	Eastern cottonwood
1092:					
Gillett Grove	Siberian peashrub, common lilac	---	Eastern redcedar, blue spruce, common hackberry, ponderosa pine	Golden willow, green ash, honeylocust, silver maple	Eastern cottonwood

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and component name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
1259:					
Biscay, depressional	Redosier dogwood	---	Black ash, tall purple willow	Black willow, golden willow, white willow	---
1385:					
Ocheda	---	Siberian peashrub, common lilac, cotoneaster, eastern arborvitae, eastern redcedar	Bur oak, white spruce, Austrian pine, Russian-olive, common hackberry	Eastern white pine, green ash	---
1508:					
Belmann	---	Siberian peashrub, common lilac, cotoneaster, eastern arborvitae	Eastern redcedar, bur oak, white spruce, common hackberry	Green ash, golden willow, honeylocust	Eastern cottonwood
1585:					
Spillville	Silky dogwood	American cranberrybush, Amur honeysuckle, Amur privet	Washington hawthorn, blue spruce, eastern arborvitae, white fir	Austrian pine, Norway spruce	Pin oak, eastern white pine
Coland	Silky dogwood	American cranberrybush, Amur honeysuckle, Amur privet	Washington hawthorn, blue spruce, white fir, eastern arborvitae, Austrian pine	Norway spruce, eastern white pine	Pin oak

Table 10.--Forestland Productivity

(Only the soils that are commonly used as forestland are listed. See text for an explanation of terms used in this table)

Map symbol and component name	Potential productivity: Common trees	Site index	Volume of wood fiber	Trees to manage
			cu ft/ac	
221:				
Klossner	Black willow	---	---	---
	Quaking aspen	56	57	
	Red maple	51	29	
	Silver maple	76	29	
	White ash	51	29	
376F:				
Cornell	Northern red oak	55	43	Eastern white pine, northern red oak, red pine, white oak
	White oak	55	43	
672:				
May City	Black oak	---	---	Norway spruce, eastern white pine, jack pine, red pine
	Jack pine	---	---	
	Northern pin oak	52	29	
672B:				
May City	Black oak	---	---	Norway spruce, eastern white pine, jack pine, red pine
	Jack pine	---	---	
	Northern pin oak	52	29	
672C2:				
May City	Black oak	---	---	Norway spruce, eastern white pine, jack pine, red pine
	Jack pine	---	---	
	Northern pin oak	52	29	

Table 11a.--Recreation

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. "Not rated" indicates that data are not available or that no rating is applicable. See text for further explanation of ratings in this table)

Map symbol and component name	Camp areas		Picnic areas		Playgrounds	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
6:						
Okoboji	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Ponding	1.00	Ponding	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.15	Restricted permeability	0.15	Restricted permeability	0.15
27B:						
Terril	Not limited		Not limited		Somewhat limited	
					Slope	0.50
27C:						
Terril	Not limited		Not limited		Very limited	
					Slope	1.00
27D:						
Terril	Somewhat limited		Somewhat limited		Very limited	
	Slope	0.63	Slope	0.63	Slope	1.00
31:						
Afton	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.21	Restricted permeability	0.21	Restricted permeability	0.21
34B:						
Estherville	Not limited		Not limited		Somewhat limited	
					Slope	0.50
41C:						
Sparta	Somewhat limited		Somewhat limited		Very limited	
	Too sandy	0.84	Too sandy	0.84	Slope	1.00
					Too sandy	0.84
48:						
Knoke	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Ponding	1.00	Ponding	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.15	Restricted permeability	0.15	Restricted permeability	0.15
54:						
Zook	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Flooding	1.00	Restricted permeability	0.94	Restricted permeability	0.94
	Restricted permeability	0.94			Flooding	0.60
55:						
Nicollet	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.98	Depth to saturated zone	0.75	Depth to saturated zone	0.98

Table 11a.--Recreation--Continued

Map symbol and component name	Camp areas: Rating class and limiting features	Value	Picnic areas: Rating class and limiting features	Value	Playgrounds: Rating class and limiting features	Value
62F:						
Storden	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
77B:						
Sac	Not limited		Not limited		Somewhat limited	
					Slope	0.50
77C:						
Sac	Not limited		Not limited		Very limited	
					Slope	1.00
77C2:						
Sac, moderately eroded	Not limited		Not limited		Very limited	
					Slope	1.00
90:						
Okoboji mucky silty clay loam	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Ponding	1.00	Ponding	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.15	Restricted permeability	0.15	Restricted permeability	0.15
95:						
Harps	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
107:						
Webster	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
108:						
Wadena	Not limited		Not limited		Not limited	
108B:						
Wadena	Not limited		Not limited		Not limited	
133:						
Colo	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Flooding	1.00			Flooding	0.60
135:						
Coland	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Flooding	1.00			Flooding	0.60
138B:						
Clarion	Not limited		Not limited		Somewhat limited	
					Slope	0.50
138C2:						
Clarion, moderately eroded	Not limited		Not limited		Very limited	
					Slope	1.00

Table 11a.--Recreation--Continued

Map symbol and component name	Camp areas		Picnic areas		Playgrounds	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
175:						
Dickinson	Not limited		Not limited		Not limited	
175B:						
Dickinson	Not limited		Not limited		Somewhat limited	
					Slope	0.50
191:						
Rushmore	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.21	Restricted permeability	0.21	Restricted permeability	0.21
201B:						
Coland	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Flooding	1.00			Flooding	0.60
Terril	Not limited		Not limited		Somewhat limited	
					Slope	0.50
202:						
Cylinder, 24 to 32 inches to sand and gravel	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.98	Depth to saturated zone	0.75	Depth to saturated zone	0.98
203:						
Cylinder, 32 to 40 inches to sand and gravel	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.98	Depth to saturated zone	0.75	Depth to saturated zone	0.98
221:						
Klossner	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Ponding	1.00	Ponding	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
259:						
Biscay	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
274:						
Rolfe	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Ponding	1.00	Ponding	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.94	Restricted permeability	0.94	Restricted permeability	0.94
282:						
Ransom	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.98	Depth to saturated zone	0.75	Depth to saturated zone	0.98
	Restricted permeability	0.21	Restricted permeability	0.21	Restricted permeability	0.21

Table 11a.--Recreation--Continued

Map symbol and component name	Camp areas: Rating class and limiting features	Value	Picnic areas: Rating class and limiting features	Value	Playgrounds: Rating class and limiting features	Value
308:						
Wadena, 32 to 40 inches to sand and gravel	Not limited		Not limited		Not limited	
308B:						
Wadena, 32 to 40 inches to sand and gravel	Not limited		Not limited		Somewhat limited	
					Slope	0.50
354:						
Aquolls (marsh), ponded	Not rated		Not rated		Not rated	
375:						
Fostoria, lacustrine substratum	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.98	Depth to saturated zone	0.75	Depth to saturated zone	0.98
376F:						
Cornell	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
	Restricted permeability	0.21	Restricted permeability	0.21	Restricted permeability	0.21
379:						
Ocheyedan, lacustrine substratum	Not limited		Not limited		Not limited	
379B:						
Ocheyedan, lacustrine substratum	Not limited		Not limited		Somewhat limited	
					Slope	0.50
379C2:						
Ocheyedan, lacustrine substratum, moderately eroded	Not limited		Not limited		Very limited	
					Slope	1.00
384:						
Collinwood	Very limited		Very limited		Very limited	
	Too clayey	1.00	Too clayey	1.00	Too clayey	1.00
	Depth to saturated zone	0.98	Depth to saturated zone	0.75	Depth to saturated zone	0.98
	Restricted permeability	0.60	Restricted permeability	0.60	Restricted permeability	0.60
390:						
Waldorf	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.43	Restricted permeability	0.43	Restricted permeability	0.43

Table 11a.--Recreation--Continued

Map symbol and component name	Camp areas		Picnic areas		Playgrounds	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
397:						
Letri	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.21	Restricted permeability	0.21	Restricted permeability	0.21
433E:						
Moneta	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
433F:						
Moneta	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
433G:						
Moneta	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
455:						
Wilmonton	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.98	Depth to saturated zone	0.75	Depth to saturated zone	0.98
	Restricted permeability	0.21	Restricted permeability	0.21	Restricted permeability	0.21
456:						
Wilmonton	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.98	Depth to saturated zone	0.75	Depth to saturated zone	0.98
	Restricted permeability	0.21	Restricted permeability	0.21	Restricted permeability	0.21
485:						
Spillville	Very limited		Somewhat limited		Somewhat limited	
	Flooding	1.00	Depth to saturated zone	0.75	Depth to saturated zone	0.98
	Depth to saturated zone	0.98			Flooding	0.60
506:						
Wacousta	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Ponding	1.00	Ponding	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
507:						
Canisteo	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
541C:						
Estherville	Not limited		Not limited		Very limited	
					Slope	1.00
Hawick	Somewhat limited		Somewhat limited		Very limited	
	Too sandy	0.60	Too sandy	0.60	Slope	1.00
					Too sandy	0.60
					Gravel content	0.04
559:						
Talcot	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00

Table 11a.--Recreation--Continued

Map symbol and component name	Camp areas: Rating class and limiting features	Camp areas: Value	Picnic areas: Rating class and limiting features	Picnic areas: Value	Playgrounds: Rating class and limiting features	Playgrounds: Value
577B:						
Everly	Not limited		Not limited		Somewhat limited	
					Slope	0.50
577C2:						
Everly, moderately eroded	Not limited		Not limited		Very limited	
					Slope	1.00
637D2:						
Everly, moderately eroded	Somewhat limited		Somewhat limited		Very limited	
	Slope	0.63	Slope	0.63	Slope	1.00
Moneta, moderately eroded	Somewhat limited		Somewhat limited		Very limited	
	Slope	0.63	Slope	0.63	Slope	1.00
638C2:						
Clarion, moderately eroded	Not limited		Not limited		Very limited	
					Slope	1.00
Storden, moderately eroded	Not limited		Not limited		Very limited	
					Slope	1.00
672:						
May City	Not limited		Not limited		Not limited	
672B:						
May City	Not limited		Not limited		Somewhat limited	
					Slope	0.50
672C2:						
May City, moderately eroded	Not limited		Not limited		Very limited	
					Slope	1.00
709:						
Fairhaven	Not limited		Not limited		Not limited	
733:						
Calco	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Flooding	1.00			Flooding	0.60
735:						
Havelock	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Flooding	1.00			Flooding	0.60
740D:						
Hawick	Somewhat limited		Somewhat limited		Very limited	
	Slope	0.63	Slope	0.63	Slope	1.00
	Too sandy	0.60	Too sandy	0.60	Too sandy	0.60
					Gravel content	0.04
810:						
Galva, terrace	Not limited		Not limited		Not limited	

Table 11a.--Recreation--Continued

Map symbol and component name	Camp areas		Picnic areas		Playgrounds	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
810B:						
Galva, terrace	Not limited		Not limited		Somewhat limited	
					Slope	0.50
828B:						
Zenor	Not limited		Not limited		Somewhat limited	
					Slope	0.50
					Gravel content	0.04
828C2:						
Zenor, moderately eroded	Not limited		Not limited		Very limited	
					Slope	1.00
					Gravel content	0.04
835D2:						
Storden, moderately eroded	Somewhat limited		Somewhat limited		Very limited	
	Slope	0.63	Slope	0.63	Slope	1.00
Omsrud, moderately eroded	Somewhat limited		Somewhat limited		Very limited	
	Slope	0.63	Slope	0.63	Slope	1.00
835E2:						
Storden, moderately eroded	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
Omsrud, moderately eroded	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
854D:						
Histosols, fens	Not rated		Not rated		Not rated	
874:						
Dickinson, lacustrine substratum	Not limited		Not limited		Not limited	
874B:						
Dickinson, lacustrine substratum	Not limited		Not limited		Somewhat limited	
					Slope	0.50
874C2:						
Dickinson, lacustrine substratum, moderately eroded	Not limited		Not limited		Very limited	
					Slope	1.00
875:						
Roine	Not limited		Not limited		Not limited	
875B:						
Roine	Not limited		Not limited		Somewhat limited	
					Slope	0.50

Table 11a.--Recreation--Continued

Map symbol and component name	Camp areas: Rating class and limiting features	Camp areas: Value	Picnic areas: Rating class and limiting features	Picnic areas: Value	Playgrounds: Rating class and limiting features	Playgrounds: Value
875C2:						
Roine, moderately eroded	Not limited		Not limited		Very limited	
					Slope	1.00
878:						
Ocheyedan	Not limited		Not limited		Not limited	
878B:						
Ocheyedan	Not limited		Not limited		Somewhat limited	
					Slope	0.50
879:						
Fostoria	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.98	Depth to saturated zone	0.75	Depth to saturated zone	0.98
928:						
Annieville	Not limited		Not limited		Not limited	
928B:						
Annieville	Not limited		Not limited		Somewhat limited	
					Slope	0.50
992:						
Gillett Grove	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Ponding	1.00	Ponding	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.21	Restricted permeability	0.21	Restricted permeability	0.21
1053:						
Belmann, gypsum phase	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.21	Restricted permeability	0.21	Restricted permeability	0.21
1091:						
McCreath	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.98	Depth to saturated zone	0.75	Depth to saturated zone	0.98
1092:						
Gillett Grove	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.21	Restricted permeability	0.21	Restricted permeability	0.21
1133:						
Colo	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Flooding	1.00	Flooding	0.40	Flooding	1.00
1259:						
Biscay, depressional	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Ponding	1.00	Ponding	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00

Table 11a.--Recreation--Continued

Map symbol and component name	Camp areas		Picnic areas		Playgrounds	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1385:						
Ocheda	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.98	Depth to saturated zone	0.75	Depth to saturated zone	0.98
	Restricted permeability	0.60	Restricted permeability	0.60	Restricted permeability	0.60
1508:						
Belmann	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.43	Restricted permeability	0.43	Restricted permeability	0.43
1585:						
Spillville	Very limited		Somewhat limited		Very limited	
	Flooding	1.00	Flooding	0.40	Flooding	1.00
	Depth to saturated zone	0.39	Depth to saturated zone	0.19	Depth to saturated zone	0.39
Coland	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Flooding	1.00	Flooding	0.40	Flooding	1.00
5010:						
Pits, sand and gravel	Not rated		Not rated		Not rated	
5040:						
Udorthents, loamy	Not rated		Not rated		Not rated	
5060:						
Pits, clay	Not rated		Not rated		Not rated	
AW:						
Animal waste	Not rated		Not rated		Not rated	
SL:						
Sewage lagoon	Not rated		Not rated		Not rated	
W:						
Water	Not rated		Not rated		Not rated	

Table 11b.--Recreation

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. "Not rated" indicates that data are not available or that no rating is applicable. See text for further explanation of ratings in this table)

Map symbol and component name	Paths and trails		Off-road motorcycle trails		Golf fairways	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
6:						
Okoboji	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Ponding	1.00
	Ponding	1.00	Ponding	1.00	Depth to saturated zone	1.00
27B:						
Terril	Not limited		Not limited		Not limited	
27C:						
Terril	Not limited		Not limited		Not limited	
27D:						
Terril	Not limited		Not limited		Somewhat limited	
					Slope	0.63
31:						
Afton	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
34B:						
Estherville	Not limited		Not limited		Somewhat limited	
					Droughty	0.10
41C:						
Sparta	Somewhat limited		Somewhat limited		Somewhat limited	
	Too sandy	0.84	Too sandy	0.84	Droughty	0.48
48:						
Knoke	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Ponding	1.00
	Ponding	1.00	Ponding	1.00	Depth to saturated zone	1.00
54:						
Zook	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
					Flooding	0.60
55:						
Nicollet	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.44	Depth to saturated zone	0.44	Depth to saturated zone	0.75
62F:						
Storden	Somewhat limited		Not limited		Very limited	
	Slope	0.82			Slope	1.00
77B:						
Sac	Not limited		Not limited		Not limited	
77C:						
Sac	Not limited		Not limited		Not limited	

Table 11b.--Recreation--Continued

Map symbol and component name	Paths and trails: Rating class and limiting features	Paths and trails: Value	Off-road motorcycle trails: Rating class and limiting features	Off-road motorcycle trails: Value	Golf fairways: Rating class and limiting features	Golf fairways: Value
77C2:						
Sac, moderately eroded	Not limited		Not limited		Not limited	
90:						
Okoboji mucky silty clay loam	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Ponding	1.00
	Ponding	1.00	Ponding	1.00	Depth to saturated zone	1.00
95:						
Harps	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
107:						
Webster	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
108:						
Wadena	Not limited		Not limited		Not limited	
108B:						
Wadena	Not limited		Not limited		Not limited	
133:						
Colo	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
					Flooding	0.60
135:						
Coland	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
					Flooding	0.60
138B:						
Clarion	Not limited		Not limited		Not limited	
138C2:						
Clarion, moderately eroded	Not limited		Not limited		Not limited	
175:						
Dickinson	Not limited		Not limited		Not limited	
175B:						
Dickinson	Not limited		Not limited		Not limited	
191:						
Rushmore	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
201B:						
Coland	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
					Flooding	0.60

Table 11b.--Recreation--Continued

Map symbol and component name	Paths and trails: Rating class and limiting features	Value	Off-road motorcycle trails: Rating class and limiting features	Value	Golf fairways: Rating class and limiting features	Value
201B:						
Terril	Not limited		Not limited		Not limited	
202:						
Cylinder, 24 to 32 inches to sand and gravel	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.44	Depth to saturated zone	0.44	Depth to saturated zone	0.75
203:						
Cylinder, 32 to 40 inches to sand and gravel	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.44	Depth to saturated zone	0.44	Depth to saturated zone	0.75
221:						
Klossner	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Ponding	1.00
	Ponding	1.00	Ponding	1.00	Depth to saturated zone	1.00
259:						
Biscay	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
274:						
Rolfe	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Ponding	1.00
	Ponding	1.00	Ponding	1.00	Depth to saturated zone	1.00
282:						
Ransom	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.44	Depth to saturated zone	0.44	Depth to saturated zone	0.75
308:						
Wadena, 32 to 40 inches to sand and gravel	Not limited		Not limited		Not limited	
308B:						
Wadena, 32 to 40 inches to sand and gravel	Not limited		Not limited		Not limited	
354:						
Aquolls (marsh), ponded	Not rated		Not rated		Not rated	
375:						
Fostoria, lacustrine substratum	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.44	Depth to saturated zone	0.44	Depth to saturated zone	0.75
376F:						
Cornell	Somewhat limited		Not limited		Very limited	
	Slope	0.82			Slope	1.00

Table 11b.--Recreation--Continued

Map symbol and component name	Paths and trails		Off-road motorcycle trails		Golf fairways	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
379:						
Ocheyedan, lacustrine substratum	Not limited		Not limited		Not limited	
379B:						
Ocheyedan, lacustrine substratum	Not limited		Not limited		Not limited	
379C2:						
Ocheyedan, lacustrine substratum, moderately eroded	Not limited		Not limited		Not limited	
384:						
Collinwood	Very limited		Very limited		Very limited	
	Too clayey	1.00	Too clayey	1.00	Too clayey	1.00
	Depth to saturated zone	0.44	Depth to saturated zone	0.44	Depth to saturated zone	0.75
390:						
Waldorf	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
397:						
Letri	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
433E:						
Moneta	Somewhat limited		Not limited		Very limited	
	Slope	0.02			Slope	1.00
433F:						
Moneta	Somewhat limited		Not limited		Very limited	
	Slope	0.82			Slope	1.00
433G:						
Moneta	Very limited		Somewhat limited		Very limited	
	Slope	1.00	Slope	0.56	Slope	1.00
455:						
Wilmonton	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.44	Depth to saturated zone	0.44	Depth to saturated zone	0.75
456:						
Wilmonton	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.44	Depth to saturated zone	0.44	Depth to saturated zone	0.75
485:						
Spillville	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.44	Depth to saturated zone	0.44	Depth to saturated zone	0.75
					Flooding	0.60

Table 11b.--Recreation--Continued

Map symbol and component name	Paths and trails: Rating class and limiting features	Value	Off-road motorcycle trails: Rating class and limiting features	Value	Golf fairways: Rating class and limiting features	Value
506:						
Wacousta	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Ponding	1.00
	Ponding	1.00	Ponding	1.00	Depth to saturated zone	1.00
507:						
Canisteo	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
541C:						
Estherville	Not limited		Not limited		Somewhat limited	
					Droughty	0.10
Hawick	Somewhat limited		Somewhat limited		Very limited	
	Too sandy	0.60	Too sandy	0.60	Droughty	0.91
559:						
Talcot	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
577B:						
Everly	Not limited		Not limited		Not limited	
577C2:						
Everly, moderately eroded	Not limited		Not limited		Not limited	
637D2:						
Everly, moderately eroded	Not limited		Not limited		Somewhat limited	
					Slope	0.63
Moneta, moderately eroded	Not limited		Not limited		Somewhat limited	
					Slope	0.63
638C2:						
Clarion, moderately eroded	Not limited		Not limited		Not limited	
Storden, moderately eroded	Not limited		Not limited		Not limited	
672:						
May City	Not limited		Not limited		Somewhat limited	
					Droughty	0.22
672B:						
May City	Not limited		Not limited		Somewhat limited	
					Droughty	0.22
672C2:						
May City, moderately eroded	Not limited		Not limited		Somewhat limited	
					Droughty	0.41
709:						
Fairhaven	Not limited		Not limited		Not limited	

Table 11b.--Recreation--Continued

Map symbol and component name	Paths and trails		Off-road motorcycle trails		Golf fairways	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
733:						
Calco	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
					Flooding	0.60
735:						
Havelock	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
					Flooding	0.60
740D:						
Hawick	Somewhat limited		Somewhat limited		Very limited	
	Too sandy	0.60	Too sandy	0.60	Droughty	0.91
					Slope	0.63
810:						
Galva, terrace	Not limited		Not limited		Not limited	
810B:						
Galva, terrace	Not limited		Not limited		Not limited	
828B:						
Zenor	Not limited		Not limited		Somewhat limited	
					Droughty	0.11
828C2:						
Zenor, moderately eroded	Not limited		Not limited		Somewhat limited	
					Droughty	0.25
835D2:						
Storden, moderately eroded	Not limited		Not limited		Somewhat limited	
					Slope	0.63
Omsrud, moderately eroded	Not limited		Not limited		Somewhat limited	
					Slope	0.63
835E2:						
Storden, moderately eroded	Somewhat limited		Not limited		Very limited	
	Slope	0.02			Slope	1.00
Omsrud, moderately eroded	Somewhat limited		Not limited		Very limited	
	Slope	0.02			Slope	1.00
854D:						
Histosols, fens	Not rated		Not rated		Not rated	
874:						
Dickinson, lacustrine substratum	Not limited		Not limited		Not limited	
874B:						
Dickinson, lacustrine substratum	Not limited		Not limited		Not limited	

Table 11b.--Recreation--Continued

Map symbol and component name	Paths and trails: Rating class and limiting features	Value	Off-road motorcycle trails: Rating class and limiting features	Value	Golf fairways: Rating class and limiting features	Value
874C2:						
Dickinson, lacustrine substratum, moderately eroded	Not limited		Not limited		Not limited	
875:						
Roine	Not limited		Not limited		Not limited	
875B:						
Roine	Not limited		Not limited		Not limited	
875C2:						
Roine, moderately eroded	Not limited		Not limited		Not limited	
878:						
Ocheyedan	Not limited		Not limited		Not limited	
878B:						
Ocheyedan	Not limited		Not limited		Not limited	
879:						
Fostoria	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.44	Depth to saturated zone	0.44	Depth to saturated zone	0.75
928:						
Annieville	Not limited		Not limited		Not limited	
928B:						
Annieville	Not limited		Not limited		Not limited	
992:						
Gillett Grove	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Ponding	1.00
	Ponding	1.00	Ponding	1.00	Depth to saturated zone	1.00
1053:						
Belmann, gypsum phase	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
1091:						
McCreath	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.44	Depth to saturated zone	0.44	Depth to saturated zone	0.75
1092:						
Gillett Grove	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
1133:						
Colo	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Flooding	1.00
	Flooding	0.40	Flooding	0.40	Depth to saturated zone	1.00

Table 11b.--Recreation--Continued

Map symbol and component name	Paths and trails		Off-road motorcycle trails		Golf fairways	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1259:						
Biscay, depressional	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Ponding	1.00
	Ponding	1.00	Ponding	1.00	Depth to saturated zone	1.00
1385:						
Ocheda	Somewhat limited		Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.44	Depth to saturated zone	0.44	Depth to saturated zone	0.75
1508:						
Belmann	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
1585:						
Spillville	Somewhat limited		Somewhat limited		Very limited	
	Flooding	0.40	Flooding	0.40	Flooding	1.00
					Depth to saturated zone	0.19
Coland	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Flooding	1.00
	Flooding	0.40	Flooding	0.40	Depth to saturated zone	1.00
5010:						
Pits, sand and gravel	Not rated		Not rated		Not rated	
5040:						
Udorthents, loamy	Not rated		Not rated		Not rated	
5060:						
Pits, clay	Not rated		Not rated		Not rated	
AW:						
Animal waste	Not rated		Not rated		Not rated	
SL:						
Sewage lagoon	Not rated		Not rated		Not rated	
W:						
Water	Not rated		Not rated		Not rated	

Table 12.--Wildlife Habitat

(See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and component name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
6:										
Okoboji	Fair	Fair	Fair	Fair	Very poor	Good	Good	Fair	Fair	Good
27B:										
Terril	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
27C:										
Terril	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
27D:										
Terril	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
31:										
Afton	Good	Good	Good	Fair	Poor	Good	Fair	Good	Fair	Fair
34B:										
Estherville	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor
41C:										
Sparta	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor
48:										
Knoke	Fair	Fair	Fair	Poor	Very poor	Good	Good	Fair	Poor	Good
54:										
Zook	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good
55:										
Nicollet	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
62F:										
Storden	Poor	Fair	Good	Fair	Poor	Very poor	Very poor	Fair	Fair	Very poor
77B:										
Sac	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
77C:										
Sac	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
77C2:										
Sac, moderately eroded	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
90:										
Okoboji mucky silty clay loam	Fair	Fair	Fair	Fair	Very poor	Good	Good	Fair	Fair	Good
95:										
Harps	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good

Table 12.--Wildlife Habitat--Continued

Map symbol and component name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
107:										
Webster	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good
108:										
Wadena	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
108B:										
Wadena	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
133:										
Colo	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good
135:										
Coland	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good
138B:										
Clarion	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
138C2:										
Clarion, moderately eroded	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
175:										
Dickinson	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
175B:										
Dickinson	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
191:										
Rushmore	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good
201B:										
Coland	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good
Terril	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
202:										
Cylinder, 24 to 32 inches to sand and gravel	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
203:										
Cylinder, 32 to 40 inches to sand and gravel	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
221:										
Klossner	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
259:										
Biscay	Good	Good	Good	Good	Fair	Good	Good	Good	Fair	Good
274:										
Rolfe	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good
282:										
Ransom	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor

Table 12.--Wildlife Habitat--Continued

Map symbol and component name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
308:										
Wadena, 32 to 40 inches to sand and gravel	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
308B:										
Wadena, 32 to 40 inches to sand and gravel	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
354:										
Aquolls (marsh), ponded	Very poor	Very poor	Fair	Very poor	Very poor	Good	Good	Fair	Poor	Good
375:										
Fostoria, lacustrine substratum	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
376F:										
Cornell	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor
379:										
Ocheyedan, lacustrine substratum	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
379B:										
Ocheyedan, lacustrine substratum	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
379C2:										
Ocheyedan, lacustrine substratum, moderately eroded	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
384:										
Collinwood	Good	Good	Good	Good	Good	Poor	Poor	Fair	Good	Poor
390:										
Waldorf	Good	Good	Fair	Fair	Fair	Good	Good	Good	Fair	Good
397:										
Letri	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good
433E:										
Moneta	Fair	Good	Good	Fair	Poor	Very poor	Very poor	Fair	Fair	Very poor
433F:										
Moneta	Poor	Fair	Good	Fair	Poor	Very poor	Very poor	Fair	Fair	Very poor
433G:										
Moneta	Poor	Fair	Good	Fair	Poor	Very poor	Very poor	Fair	Fair	Very poor
455:										
Wilmonton	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
456:										
Wilmonton	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor

Table 12.--Wildlife Habitat--Continued

Map symbol and component name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Open-land wild-life	Wood-land wild-life	Wetland wild-life
485:										
Spillville	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
506:										
Wacousta	Good	Good	Fair	Good	Good	Good	Good	Good	Good	Good
507:										
Canisteo	Good	Good	Fair	Fair	Fair	Good	Good	Good	Fair	Good
541C:										
Estherville	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor
Hawick	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor
559:										
Talcot	Good	Good	Fair	Fair	Fair	Good	Good	Good	Fair	Good
577B:										
Everly	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor
577C2:										
Everly, moderately eroded	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
637D2:										
Everly, moderately eroded	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
Moneta, moderately eroded	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
638C2:										
Clarion, moderately eroded	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
Storden, moderately eroded	Fair	Good	Good	Fair	Poor	Very poor	Very poor	Fair	Fair	Very poor
672:										
May City	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor
672B:										
May City	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor
672C2:										
May City, moderately eroded	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor
709:										
Fairhaven	Good	Good	Good	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor

Table 12.--Wildlife Habitat--Continued

Map symbol and component name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
733:										
Calco	Good	Fair	Good	Poor	Very poor	Good	Good	Fair	Poor	Fair
735:										
Havelock	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good
740D:										
Hawick	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor
810:										
Galva, terrace	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
810B:										
Galva, terrace	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
828B:										
Zenor	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor
828C2:										
Zenor, moderately eroded	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor
835D2:										
Storden, moderately eroded	Fair	Good	Good	Fair	Poor	Very poor	Very poor	Fair	Fair	Very poor
Omsrud, moderately eroded	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
835E2:										
Storden, moderately eroded	Fair	Good	Good	Fair	Poor	Very poor	Very poor	Fair	Fair	Very poor
Omsrud, moderately eroded	Fair	Good	Good	Fair	Poor	Very poor	Very poor	Fair	Fair	Very poor
854D:										
Histosols, fens	Very poor	Poor	Fair	Poor	Very poor	Good	Good	Poor	Poor	Good
874:										
Dickinson, lacustrine substratum	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
874B:										
Dickinson, lacustrine substratum	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
874C2:										
Dickinson, lacustrine substratum, moderately eroded	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor

Table 12.--Wildlife Habitat--Continued

Map symbol and component name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Open-land wild-life	Wood-land wild-life	Wetland wild-life
875:										
Roine	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Very poor
875B:										
Roine	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Very poor
875C2:										
Roine, moderately eroded	Fair	Good	Good	Good	Good	Very poor	Poor	Fair	Fair	Very poor
878:										
Ocheyedan	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
878B:										
Ocheyedan	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
879:										
Fostoria	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
928:										
Annieville	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
928B:										
Annieville	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor
992:										
Gillett Grove	Fair	Fair	Fair	Fair	Very poor	Good	Good	Fair	Fair	Good
1053:										
Belmann, gypsum phase	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
1091:										
McCreath	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
1092:										
Gillett Grove	Good	Good	Good	Fair	Poor	Good	Fair	Good	Fair	Fair
1133:										
Colo	Poor	Fair	Fair	Poor	Poor	Good	Good	Poor	Poor	Good
1259:										
Biscay, depressional	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good
1385:										
Ocheda	Fair	Fair	Fair	Good	Good	Poor	Fair	Fair	Good	Poor
1508:										
Belmann	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
1585:										
Spillville	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
Coland	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good
5010:										
Pits, sand and gravel	Poor	Poor	Fair	Good	Good	Poor	Very poor	Poor	Fair	Very poor

Table 12.--Wildlife Habitat--Continued

Map symbol and component name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
5040. Udorthents, loamy										
5060. Pits, clay										
AW. Animal waste										
SL. Sewage lagoon										
W. Water										

Table 13a.--Building Site Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. "Not rated" indicates that data are not available or that no rating is applicable. See text for further explanation of ratings in this table)

Map symbol and component name	Dwellings without basements		Dwellings with basements		Small commercial buildings	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
6:						
Okoboji	Very limited		Very limited		Very limited	
	Ponding	1.00	Ponding	1.00	Ponding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
27B:						
Terril	Not limited		Somewhat limited		Not limited	
			Depth to saturated zone	0.16		
27C:						
Terril	Not limited		Somewhat limited		Somewhat limited	
			Depth to saturated zone	0.16	Slope	0.88
27D:						
Terril	Somewhat limited		Somewhat limited		Very limited	
	Slope	0.63	Slope	0.63	Slope	1.00
			Depth to saturated zone	0.16		
31:						
Afton	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
34B:						
Estherville	Not limited		Not limited		Not limited	
41C:						
Sparta	Not limited		Not limited		Somewhat limited	
					Slope	0.88
48:						
Knoke	Very limited		Very limited		Very limited	
	Ponding	1.00	Ponding	1.00	Ponding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
54:						
Zook	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Flooding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
55:						
Nicollet	Very limited		Very limited		Very limited	
	Depth to saturated zone	0.98	Depth to saturated zone	1.00	Depth to saturated zone	0.98

Table 13a.--Building Site Development--Continued

Map symbol and component name	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
62F:						
Storden	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
77B:						
Sac	Somewhat limited		Somewhat limited		Somewhat limited	
	Shrink-swell	0.50	Depth to saturated zone	0.16	Shrink-swell	0.50
77C:						
Sac	Somewhat limited		Somewhat limited		Somewhat limited	
	Shrink-swell	0.50	Depth to saturated zone	0.16	Slope	0.88
					Shrink-swell	0.50
77C2:						
Sac, moderately eroded	Somewhat limited		Somewhat limited		Somewhat limited	
	Shrink-swell	0.50	Depth to saturated zone	0.16	Slope	0.88
					Shrink-swell	0.50
90:						
Okoboji mucky silty clay loam	Very limited		Very limited		Very limited	
	Ponding	1.00	Ponding	1.00	Ponding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
95:						
Harps	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
107:						
Webster	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	0.32			Shrink-swell	0.32
108:						
Wadena	Not limited		Not limited		Not limited	
108B:						
Wadena	Not limited		Not limited		Not limited	
133:						
Colo	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Flooding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
135:						
Coland	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Flooding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
138B:						
Clarion	Somewhat limited		Somewhat limited		Somewhat limited	
	Shrink-swell	0.01	Depth to saturated zone	0.16	Shrink-swell	0.01

Table 13a.--Building Site Development--Continued

Map symbol and component name	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
138C2:						
Clarion, moderately eroded	Not limited		Somewhat limited		Somewhat limited	
			Depth to saturated zone	0.16	Slope	0.88
175:						
Dickinson	Not limited		Not limited		Not limited	
175B:						
Dickinson	Not limited		Not limited		Not limited	
191:						
Rushmore	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
201B:						
Coland	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Flooding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
Terril	Not limited		Somewhat limited		Not limited	
			Depth to saturated zone	0.16		
202:						
Cylinder, 24 to 32 inches to sand and gravel	Very limited		Very limited		Very limited	
	Depth to saturated zone	0.98	Depth to saturated zone	1.00	Depth to saturated zone	0.98
203:						
Cylinder, 32 to 40 inches to sand and gravel	Very limited		Very limited		Very limited	
	Depth to saturated zone	0.98	Depth to saturated zone	1.00	Depth to saturated zone	0.98
221:						
Klossner	Very limited		Very limited		Very limited	
	Ponding	1.00	Ponding	1.00	Ponding	1.00
	Subsidence	1.00	Subsidence	1.00	Subsidence	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Content of organic matter	1.00			Content of organic matter	1.00
259:						
Biscay	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
274:						
Rolfe	Very limited		Very limited		Very limited	
	Ponding	1.00	Ponding	1.00	Ponding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00

Table 13a.--Building Site Development--Continued

Map symbol and component name	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
282:						
Ransom	Very limited		Very limited		Very limited	
	Depth to saturated zone	0.98	Depth to saturated zone	1.00	Depth to saturated zone	0.98
	Shrink-swell	0.50			Shrink-swell	0.50
308:						
Wadena, 32 to 40 inches to sand and gravel	Not limited		Not limited		Not limited	
308B:						
Wadena, 32 to 40 inches to sand and gravel	Not limited		Not limited		Not limited	
354:						
Aquolls (marsh), ponded	Not rated		Not rated		Not rated	
375:						
Fostoria, lacustrine substratum	Very limited		Very limited		Very limited	
	Depth to saturated zone	0.98	Depth to saturated zone	1.00	Depth to saturated zone	0.98
376F:						
Cornell	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
			Depth to saturated zone	0.16		
379:						
Ocheyedan, lacustrine substratum	Not limited		Somewhat limited		Not limited	
			Depth to saturated zone	0.16		
379B:						
Ocheyedan, lacustrine substratum	Not limited		Somewhat limited		Not limited	
			Depth to saturated zone	0.16		
379C2:						
Ocheyedan, lacustrine substratum, moderately eroded	Not limited		Somewhat limited		Somewhat limited	
			Depth to saturated zone	0.16	Slope	0.88
384:						
Collinwood	Very limited		Very limited		Very limited	
	Shrink-swell	1.00	Depth to saturated zone	1.00	Shrink-swell	1.00
	Depth to saturated zone	0.98	Shrink-swell	1.00	Depth to saturated zone	0.98

Table 13a.--Building Site Development--Continued

Map symbol and component name	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
390:						
Waldorf	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	1.00	Shrink-swell	0.50	Shrink-swell	1.00
397:						
Letri	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
433E:						
Moneta	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
433F:						
Moneta	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
433G:						
Moneta	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
455:						
Wilmonton	Very limited		Very limited		Very limited	
	Depth to saturated zone	0.98	Depth to saturated zone	1.00	Depth to saturated zone	0.98
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
456:						
Wilmonton	Very limited		Very limited		Very limited	
	Depth to saturated zone	0.98	Depth to saturated zone	1.00	Depth to saturated zone	0.98
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
485:						
Spillville	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Flooding	1.00
	Depth to saturated zone	0.98	Depth to saturated zone	1.00	Depth to saturated zone	0.98
506:						
Wacousta	Very limited		Very limited		Very limited	
	Ponding	1.00	Ponding	1.00	Ponding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
507:						
Canisteo	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	0.01			Shrink-swell	0.01
541C:						
Estherville	Not limited		Not limited		Somewhat limited	
					Slope	0.88
Hawick	Not limited		Not limited		Somewhat limited	
					Slope	0.88

Table 13a.--Building Site Development--Continued

Map symbol and component name	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
559:						
Talcot	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	0.50			Shrink-swell	0.50
577B:						
Everly	Somewhat limited		Somewhat limited		Somewhat limited	
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
			Depth to saturated zone	0.16		
577C2:						
Everly, moderately eroded	Somewhat limited		Somewhat limited		Somewhat limited	
	Shrink-swell	0.50	Shrink-swell	0.50	Slope	0.88
			Depth to saturated zone	0.16	Shrink-swell	0.50
637D2:						
Everly, moderately eroded	Somewhat limited		Somewhat limited		Very limited	
	Slope	0.63	Slope	0.63	Slope	1.00
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
			Depth to saturated zone	0.16		
Moneta, moderately eroded	Somewhat limited		Somewhat limited		Very limited	
	Slope	0.63	Slope	0.63	Slope	1.00
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
638C2:						
Clarion, moderately eroded	Not limited		Somewhat limited		Somewhat limited	
			Depth to saturated zone	0.16	Slope	0.88
Storden, moderately eroded	Not limited		Not limited		Somewhat limited	
					Slope	0.88
672:						
May City	Not limited		Not limited		Not limited	
672B:						
May City	Not limited		Not limited		Not limited	
672C2:						
May City, moderately eroded	Not limited		Not limited		Somewhat limited	
					Slope	0.88
709:						
Fairhaven	Not limited		Not limited		Not limited	
733:						
Calco	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Flooding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50

Table 13a.--Building Site Development--Continued

Map symbol and component name	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
735:						
Havelock	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Flooding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	1.00			Shrink-swell	1.00
740D:						
Hawick	Somewhat limited		Somewhat limited		Very limited	
	Slope	0.63	Slope	0.63	Slope	1.00
810:						
Galva, terrace	Somewhat limited		Somewhat limited		Somewhat limited	
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
810B:						
Galva, terrace	Somewhat limited		Somewhat limited		Somewhat limited	
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
828B:						
Zenor	Not limited		Not limited		Not limited	
828C2:						
Zenor, moderately eroded	Not limited		Not limited		Somewhat limited	
					Slope	0.88
835D2:						
Storden, moderately eroded	Somewhat limited		Somewhat limited		Very limited	
	Slope	0.63	Slope	0.63	Slope	1.00
Omsrud, moderately eroded	Somewhat limited		Somewhat limited		Very limited	
	Slope	0.63	Slope	0.63	Slope	1.00
835E2:						
Storden, moderately eroded	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
Omsrud, moderately eroded	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
854D:						
Histosols, fens	Not rated		Not rated		Not rated	
874:						
Dickinson, lacustrine substratum	Not limited		Not limited		Not limited	
874B:						
Dickinson, lacustrine substratum	Not limited		Not limited		Not limited	

Table 13a.--Building Site Development--Continued

Map symbol and component name	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
874C2:						
Dickinson, lacustrine substratum, moderately eroded	Not limited		Not limited		Somewhat limited	
					Slope	0.88
875:						
Roine	Not limited		Somewhat limited		Not limited	
			Depth to saturated zone	0.16		
875B:						
Roine	Not limited		Somewhat limited		Not limited	
			Depth to saturated zone	0.16		
875C2:						
Roine, moderately eroded	Not limited		Somewhat limited		Somewhat limited	
			Depth to saturated zone	0.16	Slope	0.88
878:						
Ocheyedan	Not limited		Somewhat limited		Not limited	
			Depth to saturated zone	0.16		
878B:						
Ocheyedan	Not limited		Somewhat limited		Not limited	
			Depth to saturated zone	0.16		
879:						
Fostoria	Very limited		Very limited		Very limited	
	Depth to saturated zone	0.98	Depth to saturated zone	1.00	Depth to saturated zone	0.98
928:						
Annieville	Somewhat limited		Somewhat limited		Somewhat limited	
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
			Depth to saturated zone	0.16		
928B:						
Annieville	Somewhat limited		Somewhat limited		Somewhat limited	
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
			Depth to saturated zone	0.16		
992:						
Gillett Grove	Very limited		Very limited		Very limited	
	Ponding	1.00	Ponding	1.00	Ponding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
1053:						
Belmann, gypsum phase	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00

Table 13a.--Building Site Development--Continued

Map symbol and component name	Dwellings without basements: Rating class and limiting features	Value	Dwellings with basements: Rating class and limiting features	Value	Small commercial buildings: Rating class and limiting features	Value
1091:						
McCreath------------	Very limited		Very limited		Very limited	
	Shrink-swell	1.00	Depth to saturated zone	1.00	Shrink-swell	1.00
	Depth to saturated zone	0.98			Depth to saturated zone	0.98
1092:						
Gillett Grove-------	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
1133:						
Colo----------------	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Flooding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
1259:						
Biscay, depressional	Very limited		Very limited		Very limited	
	Ponding	1.00	Ponding	1.00	Ponding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	0.50			Shrink-swell	0.50
1385:						
Ocheda--------------	Very limited		Very limited		Very limited	
	Shrink-swell	1.00	Depth to saturated zone	1.00	Shrink-swell	1.00
	Depth to saturated zone	0.98	Shrink-swell	1.00	Depth to saturated zone	0.98
1508:						
Belmann-------------	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
1585:						
Spillville----------	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Flooding	1.00
	Depth to saturated zone	0.39	Depth to saturated zone	1.00	Depth to saturated zone	0.39
Coland--------------	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Flooding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Shrink-swell	0.50	Shrink-swell	0.50	Shrink-swell	0.50
5010:						
Pits, sand and gravel-------------	Not rated		Not rated		Not rated	
5040:						
Udorthents, loamy---	Not rated		Not rated		Not rated	
5060:						
Pits, clay----------	Not rated		Not rated		Not rated	
AW:						
Animal waste--------	Not rated		Not rated		Not rated	

Table 13a.--Building Site Development--Continued

Map symbol and component name	Dwellings without basements		Dwellings with basements		Small commercial buildings	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
SL:						
Sewage lagoon-------	Not rated		Not rated		Not rated	
W:						
Water---------------	Not rated		Not rated		Not rated	

Table 13b.--Building Site Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. "Not rated" indicates that data are not available or that no rating is applicable. See text for further explanation of ratings in this table)

Map symbol and component name	Local roads and streets		Shallow excavations		Lawns and landscaping	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
6:						
Okoboji	Very limited		Very limited		Very limited	
	Low strength	1.00	Ponding	1.00	Ponding	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00				
	Frost action	1.00				
	Shrink-swell	1.00				
27B:						
Terril	Very limited		Somewhat limited		Not limited	
	Low strength	1.00	Depth to saturated zone	0.16		
	Frost action	0.50				
27C:						
Terril	Very limited		Somewhat limited		Not limited	
	Low strength	1.00	Depth to saturated zone	0.16		
	Frost action	0.50				
27D:						
Terril	Very limited		Somewhat limited		Somewhat limited	
	Low strength	1.00	Slope	0.63	Slope	0.63
	Slope	0.63	Depth to saturated zone	0.16		
	Frost action	0.50				
31:						
Afton	Very limited		Very limited		Very limited	
	Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00				
	Frost action	1.00				
	Shrink-swell	1.00				
34B:						
Estherville	Not limited		Very limited		Somewhat limited	
			Cutbanks cave	0.90	Droughty	0.10
41C:						
Sparta	Not limited		Very limited		Somewhat limited	
			Cutbanks cave	0.90	Droughty	0.48
48:						
Knoke	Very limited		Very limited		Very limited	
	Ponding	1.00	Ponding	1.00	Ponding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Frost action	1.00				
	Shrink-swell	1.00				

Table 13b.--Building Site Development--Continued

Map symbol and component name	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
54:						
Zook	Very limited		Very limited		Very limited	
	Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Flooding	0.60	Flooding	0.60
	Frost action	1.00	Too clayey	0.01		
	Flooding	1.00				
	Shrink-swell	1.00				
55:						
Nicollet	Very limited		Very limited		Somewhat limited	
	Frost action	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.75
	Depth to saturated zone	0.75				
62F:						
Storden	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
	Frost action	0.50				
77B:						
Sac	Very limited		Somewhat limited		Not limited	
	Low strength	1.00	Depth to saturated zone	0.16		
	Frost action	1.00				
	Shrink-swell	0.50				
77C:						
Sac	Very limited		Somewhat limited		Not limited	
	Low strength	1.00	Depth to saturated zone	0.16		
	Frost action	1.00				
	Shrink-swell	0.50				
77C2:						
Sac, moderately eroded	Very limited		Somewhat limited		Not limited	
	Low strength	1.00	Depth to saturated zone	0.16		
	Frost action	1.00				
	Shrink-swell	0.50				
90:						
Okoboji mucky silty clay loam	Very limited		Very limited		Very limited	
	Low strength	1.00	Ponding	1.00	Ponding	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00				
	Frost action	1.00				
	Shrink-swell	1.00				
95:						
Harps	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Frost action	1.00				
	Low strength	1.00				
107:						
Webster	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Frost action	1.00				
	Low strength	1.00				
	Shrink-swell	0.32				

Table 13b.--Building Site Development--Continued

Map symbol and component name	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
108:						
Wadena---------------	Not limited		Not limited		Not limited	
108B:						
Wadena---------------	Not limited		Not limited		Not limited	
133:						
Colo-----------------	Very limited		Very limited		Very limited	
	Low strength	1.00	Depth to	1.00	Depth to	1.00
	Depth to	1.00	saturated zone		saturated zone	
	saturated zone		Flooding	0.60	Flooding	0.60
	Frost action	1.00				
	Flooding	1.00				
	Shrink-swell	0.50				
135:						
Coland---------------	Very limited		Very limited		Very limited	
	Depth to	1.00	Depth to	1.00	Depth to	1.00
	saturated zone		saturated zone		saturated zone	
	Frost action	1.00	Flooding	0.60	Flooding	0.60
	Flooding	1.00				
	Low strength	1.00				
	Shrink-swell	0.50				
138B:						
Clarion--------------	Somewhat limited		Somewhat limited		Not limited	
	Frost action	0.50	Depth to	0.16		
	Shrink-swell	0.01	saturated zone			
138C2:						
Clarion, moderately eroded-------------	Somewhat limited		Somewhat limited		Not limited	
	Frost action	0.50	Depth to	0.16		
			saturated zone			
175:						
Dickinson------------	Somewhat limited		Very limited		Not limited	
	Frost action	0.50	Cutbanks cave	0.90		
175B:						
Dickinson------------	Somewhat limited		Very limited		Not limited	
	Frost action	0.50	Cutbanks cave	0.90		
191:						
Rushmore-------------	Very limited		Very limited		Very limited	
	Depth to	1.00	Depth to	1.00	Depth to	1.00
	saturated zone		saturated zone		saturated zone	
	Frost action	1.00				
	Low strength	1.00				
	Shrink-swell	0.50				
201B:						
Coland---------------	Very limited		Very limited		Very limited	
	Depth to	1.00	Depth to	1.00	Depth to	1.00
	saturated zone		saturated zone		saturated zone	
	Frost action	1.00	Flooding	0.60	Flooding	0.60
	Flooding	1.00				
	Low strength	1.00				
	Shrink-swell	0.50				
Terril---------------	Very limited		Somewhat limited		Not limited	
	Low strength	1.00	Depth to	0.16		
	Frost action	0.50	saturated zone			

Table 13b.--Building Site Development--Continued

Map symbol and component name	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
202:						
Cylinder, 24 to 32 inches to sand and gravel	Very limited		Very limited		Somewhat limited	
	Frost action	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.75
	Depth to saturated zone	0.75				
203:						
Cylinder, 32 to 40 inches to sand and gravel	Very limited		Very limited		Somewhat limited	
	Frost action	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.75
	Depth to saturated zone	0.75	Cutbanks cave	0.90		
221:						
Klossner	Very limited		Very limited		Very limited	
	Ponding	1.00	Ponding	1.00	Ponding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Subsidence	1.00	Content of organic matter	1.00		
	Frost action	1.00				
259:						
Biscay	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Frost action	1.00				
	Low strength	0.78				
274:						
Rolfe	Very limited		Very limited		Very limited	
	Low strength	1.00	Ponding	1.00	Ponding	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Too clayey	0.01		
	Frost action	1.00				
	Shrink-swell	1.00				
282:						
Ransom	Very limited		Very limited		Somewhat limited	
	Frost action	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.75
	Low strength	1.00				
	Depth to saturated zone	0.75				
	Shrink-swell	0.50				
308:						
Wadena, 32 to 40 inches to sand and gravel	Not limited		Not limited		Not limited	
308B:						
Wadena, 32 to 40 inches to sand and gravel	Not limited		Not limited		Not limited	
354:						
Aquolls (marsh), ponded	Not rated		Not rated		Not rated	

Table 13b.--Building Site Development--Continued

Map symbol and component name	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
375:						
Fostoria, lacustrine substratum	Very limited		Very limited		Somewhat limited	
	Frost action	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.75
	Low strength	1.00				
	Depth to saturated zone	0.75				
376F:						
Cornell	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
	Low strength	1.00	Depth to saturated zone	0.16		
	Shrink-swell	0.50				
	Frost action	0.50				
379:						
Ocheyedan, lacustrine substratum	Very limited		Somewhat limited		Not limited	
	Frost action	1.00	Depth to saturated zone	0.16		
379B:						
Ocheyedan, lacustrine substratum	Very limited		Somewhat limited		Not limited	
	Frost action	1.00	Depth to saturated zone	0.16		
			Too clayey	0.03		
379C2:						
Ocheyedan, lacustrine substratum, moderately eroded	Very limited		Somewhat limited		Not limited	
	Frost action	1.00	Depth to saturated zone	0.16		
384:						
Collinwood	Very limited		Very limited		Very limited	
	Low strength	1.00	Depth to saturated zone	1.00	Too clayey	1.00
	Frost action	1.00	Too clayey	0.28	Depth to saturated zone	0.75
	Shrink-swell	1.00				
	Depth to saturated zone	0.75				
390:						
Waldorf	Very limited		Very limited		Very limited	
	Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Too clayey	0.28		
	Frost action	1.00				
	Shrink-swell	1.00				
397:						
Letri	Very limited		Very limited		Very limited	
	Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00				
	Frost action	1.00				
	Shrink-swell	0.50				

Table 13b.--Building Site Development--Continued

Map symbol and component name	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
433E:						
Moneta	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
	Shrink-swell	0.50				
	Frost action	0.50				
433F:						
Moneta	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
	Shrink-swell	0.50				
	Frost action	0.50				
433G:						
Moneta	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
	Shrink-swell	0.50				
	Frost action	0.50				
455:						
Wilmonton	Very limited		Very limited		Somewhat limited	
	Frost action	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.75
	Low strength	1.00				
	Depth to saturated zone	0.75				
	Shrink-swell	0.50				
456:						
Wilmonton	Very limited		Very limited		Somewhat limited	
	Frost action	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.75
	Low strength	1.00				
	Depth to saturated zone	0.75				
	Shrink-swell	0.50				
485:						
Spillville	Very limited		Very limited		Somewhat limited	
	Flooding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.75
	Low strength	1.00	Flooding	0.60	Flooding	0.60
	Depth to saturated zone	0.75				
	Frost action	0.50				
506:						
Wacousta	Very limited		Very limited		Very limited	
	Ponding	1.00	Ponding	1.00	Ponding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Frost action	1.00				
	Low strength	1.00				
507:						
Canisteo	Very limited		Very limited		Very limited	
	Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00				
	Frost action	1.00				
	Shrink-swell	0.01				
541C:						
Estherville	Not limited		Very limited		Somewhat limited	
			Cutbanks cave	0.90	Droughty	0.10

Table 13b.--Building Site Development--Continued

Map symbol and component name	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
541C:						
Hawick	Not limited		Very limited		Very limited	
			Cutbanks cave	0.90	Droughty	0.91
559:						
Talcot	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Frost action	1.00	Cutbanks cave	0.90		
	Shrink-swell	0.50				
577B:						
Everly	Very limited		Somewhat limited		Not limited	
	Low strength	1.00	Depth to saturated zone	0.16		
	Shrink-swell	0.50				
	Frost action	0.50				
577C2:						
Everly, moderately eroded	Very limited		Somewhat limited		Not limited	
	Low strength	1.00	Depth to saturated zone	0.16		
	Shrink-swell	0.50				
	Frost action	0.50				
637D2:						
Everly, moderately eroded	Very limited		Somewhat limited		Somewhat limited	
	Low strength	1.00	Slope	0.63	Slope	0.63
	Slope	0.63	Depth to saturated zone	0.16		
	Shrink-swell	0.50				
	Frost action	0.50				
Moneta, moderately eroded	Somewhat limited		Somewhat limited		Somewhat limited	
	Slope	0.63	Slope	0.63	Slope	0.63
	Shrink-swell	0.50				
	Frost action	0.50				
638C2:						
Clarion, moderately eroded	Somewhat limited		Somewhat limited		Not limited	
	Frost action	0.50	Depth to saturated zone	0.16		
Storden, moderately eroded	Somewhat limited		Not limited		Not limited	
	Frost action	0.50				
672:						
May City	Not limited		Not limited		Somewhat limited	
					Droughty	0.22
672B:						
May City	Not limited		Not limited		Somewhat limited	
					Droughty	0.22
672C2:						
May City, moderately eroded	Not limited		Not limited		Somewhat limited	
					Droughty	0.41

Table 13b.--Building Site Development--Continued

Map symbol and component name	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
709:						
Fairhaven	Somewhat limited		Not limited		Not limited	
	Frost action	0.50				
733:						
Calco	Very limited		Very limited		Very limited	
	Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Flooding	0.60	Flooding	0.60
	Frost action	1.00				
	Flooding	1.00				
	Shrink-swell	0.50				
735:						
Havelock	Very limited		Very limited		Very limited	
	Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Flooding	0.60	Flooding	0.60
	Frost action	1.00				
	Flooding	1.00				
	Shrink-swell	1.00				
740D:						
Hawick	Somewhat limited		Very limited		Very limited	
	Slope	0.63	Cutbanks cave	0.90	Droughty	0.91
			Slope	0.63	Slope	0.63
810:						
Galva, terrace	Very limited		Not limited		Not limited	
	Low strength	1.00				
	Frost action	1.00				
	Shrink-swell	0.50				
810B:						
Galva, terrace	Very limited		Not limited		Not limited	
	Low strength	1.00				
	Frost action	1.00				
	Shrink-swell	0.50				
828B:						
Zenor	Not limited		Very limited		Somewhat limited	
			Cutbanks cave	0.90	Droughty	0.11
828C2:						
Zenor, moderately eroded	Not limited		Very limited		Somewhat limited	
			Cutbanks cave	0.90	Droughty	0.25
835D2:						
Storden, moderately eroded	Somewhat limited		Somewhat limited		Somewhat limited	
	Slope	0.63	Slope	0.63	Slope	0.63
	Frost action	0.50				
Omsrud, moderately eroded	Somewhat limited		Somewhat limited		Somewhat limited	
	Slope	0.63	Slope	0.63	Slope	0.63
	Frost action	0.50				

Table 13b.--Building Site Development--Continued

Map symbol and component name	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
835E2:						
Storden, moderately eroded	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
	Frost action	0.50				
Omsrud, moderately eroded	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
	Frost action	0.50				
854D:						
Histosols, fens	Not rated		Not rated		Not rated	
874:						
Dickinson, lacustrine substratum	Very limited		Very limited		Not limited	
	Frost action	1.00	Cutbanks cave	0.90		
874B:						
Dickinson, lacustrine substratum	Very limited		Very limited		Not limited	
	Frost action	1.00	Cutbanks cave	0.90		
874C2:						
Dickinson, lacustrine substratum, moderately eroded	Very limited		Very limited		Not limited	
	Frost action	1.00	Cutbanks cave	0.90		
875:						
Roine	Somewhat limited		Somewhat limited		Not limited	
	Frost action	0.50	Depth to saturated zone	0.16		
875B:						
Roine	Somewhat limited		Somewhat limited		Not limited	
	Frost action	0.50	Depth to saturated zone	0.16		
875C2:						
Roine, moderately eroded	Somewhat limited		Somewhat limited		Not limited	
	Frost action	0.50	Depth to saturated zone	0.16		
878:						
Ocheyedan	Somewhat limited		Somewhat limited		Not limited	
	Frost action	0.50	Depth to saturated zone	0.16		
878B:						
Ocheyedan	Somewhat limited		Somewhat limited		Not limited	
	Frost action	0.50	Depth to saturated zone	0.16		

Table 13b.--Building Site Development--Continued

Map symbol and component name	Local roads and streets		Shallow excavations		Lawns and landscaping	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
879:						
Fostoria	Very limited		Very limited		Somewhat limited	
	Frost action	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.75
	Low strength	1.00				
	Depth to saturated zone	0.75				
928:						
Annieville	Very limited		Somewhat limited		Not limited	
	Low strength	1.00	Depth to saturated zone	0.16		
	Frost action	1.00				
	Shrink-swell	0.50				
928B:						
Annieville	Very limited		Somewhat limited		Not limited	
	Low strength	1.00	Depth to saturated zone	0.16		
	Frost action	1.00				
	Shrink-swell	0.50				
992:						
Gillett Grove	Very limited		Very limited		Very limited	
	Low strength	1.00	Ponding	1.00	Ponding	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00				
	Frost action	1.00				
	Shrink-swell	1.00				
1053:						
Belmann, gypsum phase	Very limited		Very limited		Very limited	
	Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00				
	Frost action	1.00				
	Shrink-swell	1.00				
1091:						
McCreath	Very limited		Very limited		Somewhat limited	
	Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.75
	Frost action	1.00				
	Shrink-swell	1.00				
	Depth to saturated zone	0.75				
1092:						
Gillett Grove	Very limited		Very limited		Very limited	
	Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00				
	Frost action	1.00				
	Shrink-swell	1.00				
1133:						
Colo	Very limited		Very limited		Very limited	
	Low strength	1.00	Depth to saturated zone	1.00	Flooding	1.00
	Depth to saturated zone	1.00	Flooding	0.80	Depth to saturated zone	1.00
	Frost action	1.00				
	Flooding	1.00				
	Shrink-swell	0.50				

Table 13b.--Building Site Development--Continued

Map symbol and component name	Local roads and streets: Rating class and limiting features	Value	Shallow excavations: Rating class and limiting features	Value	Lawns and landscaping: Rating class and limiting features	Value
1259:						
Biscay, depressional	Very limited		Very limited		Very limited	
	Ponding	1.00	Ponding	1.00	Ponding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Frost action	1.00				
	Low strength	0.78				
	Shrink-swell	0.50				
1385:						
Ocheda	Very limited		Very limited		Somewhat limited	
	Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	0.75
	Frost action	1.00	Too clayey	0.28		
	Shrink-swell	1.00				
	Depth to saturated zone	0.75				
1508:						
Belmann	Very limited		Very limited		Very limited	
	Low strength	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Too clayey	0.03		
	Frost action	1.00				
	Shrink-swell	1.00				
1585:						
Spillville	Very limited		Very limited		Very limited	
	Flooding	1.00	Depth to saturated zone	1.00	Flooding	1.00
	Low strength	1.00	Flooding	0.80	Depth to saturated zone	0.19
	Frost action	0.50				
	Depth to saturated zone	0.19				
Coland	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Flooding	1.00
	Frost action	1.00	Flooding	0.80	Depth to saturated zone	1.00
	Flooding	1.00				
	Low strength	1.00				
	Shrink-swell	0.50				
5010:						
Pits, sand and gravel	Not rated		Not rated		Not rated	
5040:						
Udorthents, loamy	Not rated		Not rated		Not rated	
5060:						
Pits, clay	Not rated		Not rated		Not rated	
AW:						
Animal waste	Not rated		Not rated		Not rated	
SL:						
Sewage lagoon	Not rated		Not rated		Not rated	
W:						
Water	Not rated		Not rated		Not rated	

Table 14a.--Sanitary Facilities

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. "Not rated" indicates that data are not available or that no rating is applicable. See text for further explanation of ratings in this table)

Map symbol and component name	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
6:				
Okoboji	Very limited		Very limited	
	Ponding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Ponding	1.00
	Restricted permeability	0.91	Seepage	0.50
27B:				
Terril	Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.43	Seepage	0.50
	Restricted permeability	0.25	Slope	0.32
27C:				
Terril	Somewhat limited		Very limited	
	Depth to saturated zone	0.43	Slope	1.00
	Restricted permeability	0.24	Seepage	0.53
27D:				
Terril	Somewhat limited		Very limited	
	Slope	0.63	Slope	1.00
	Depth to saturated zone	0.43	Seepage	0.53
	Restricted permeability	0.24		
31:				
Afton	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.92	Seepage	0.28
34B:				
Estherville	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
			Slope	0.32
41C:				
Sparta	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
			Slope	1.00
48:				
Knoke	Very limited		Very limited	
	Ponding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Ponding	1.00
	Restricted permeability	0.91		

Table 14a.--Sanitary Facilities--Continued

Map symbol and component name	Septic tank absorption fields		Sewage lagoons	
	Rating class and limiting features	Value	Rating class and limiting features	Value
54:				
Zook	Very limited		Very limited	
	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Flooding	1.00
	Restricted permeability	0.99		
55:				
Nicollet	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.25	Seepage	0.50
62F:				
Storden	Very limited		Very limited	
	Slope	1.00	Slope	1.00
	Restricted permeability	0.25	Seepage	0.50
77B:				
Sac	Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.43	Seepage	0.53
			Slope	0.32
	Restricted permeability	0.24		
77C:				
Sac	Somewhat limited		Very limited	
	Depth to saturated zone	0.43	Slope	1.00
			Seepage	0.53
	Restricted permeability	0.24		
77C2:				
Sac, moderately eroded	Somewhat limited		Very limited	
	Depth to saturated zone	0.43	Slope	1.00
			Seepage	0.53
	Restricted permeability	0.24		
90:				
Okoboji mucky silty clay loam	Very limited		Very limited	
	Ponding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Ponding	1.00
	Restricted permeability	0.91	Seepage	0.50
95:				
Harps	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.25	Seepage	0.50

Table 14a.--Sanitary Facilities--Continued

Map symbol and component name	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
107:				
Webster	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.25	Seepage	0.50
108:				
Wadena	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
	Restricted permeability	0.24		
108B:				
Wadena	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
	Restricted permeability	0.24		
133:				
Colo	Very limited		Very limited	
	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Flooding	1.00
	Restricted permeability	0.24	Seepage	0.53
135:				
Coland	Very limited		Very limited	
	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Flooding	1.00
	Restricted permeability	0.25	Seepage	1.00
138B:				
Clarion	Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.43	Seepage	0.50
			Slope	0.32
	Restricted permeability	0.25		
138C2:				
Clarion, moderately eroded	Somewhat limited		Very limited	
	Depth to saturated zone	0.43	Slope	1.00
			Seepage	0.50
	Restricted permeability	0.25		
175:				
Dickinson	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
175B:				
Dickinson	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
			Slope	0.32

Table 14a.--Sanitary Facilities--Continued

Map symbol and component name	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
191:				
Rushmore	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.92	Seepage	0.53
201B:				
Coland	Very limited		Very limited	
	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Flooding	1.00
	Restricted permeability	0.25	Seepage	1.00
Terril	Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.43	Seepage	0.50
	Restricted permeability	0.25	Slope	0.32
202:				
Cylinder, 24 to 32 inches to sand and gravel	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Filtering capacity	1.00	Seepage	1.00
	Restricted permeability	0.24		
203:				
Cylinder, 32 to 40 inches to sand and gravel	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Filtering capacity	1.00	Seepage	1.00
	Restricted permeability	0.25		
221:				
Klossner	Very limited		Very limited	
	Ponding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Ponding	1.00
	Subsidence	1.00	Seepage	1.00
	Restricted permeability	0.37	Content of organic matter	1.00
259:				
Biscay	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Filtering capacity	1.00	Seepage	1.00
	Restricted permeability	0.25		

Table 14a.--Sanitary Facilities--Continued

Map symbol and component name	Septic tank absorption fields		Sewage lagoons	
	Rating class and limiting features	Value	Rating class and limiting features	Value
274:				
Rolfe	Very limited		Very limited	
	Ponding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Ponding	1.00
	Restricted permeability	0.99	Seepage	0.50
282:				
Ransom	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.92	Seepage	0.53
308:				
Wadena, 32 to 40 inches to sand and gravel	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
	Restricted permeability	0.25		
308B:				
Wadena, 32 to 40 inches to sand and gravel	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
			Slope	0.32
	Restricted permeability	0.25		
354:				
Aquolls (marsh), ponded	Not rated		Not rated	
375:				
Fostoria, lacustrine substratum	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.96	Seepage	0.53
376F:				
Cornell	Very limited		Very limited	
	Slope	1.00	Slope	1.00
	Restricted permeability	0.92	Seepage	0.53
	Depth to saturated zone	0.43		
379:				
Ocheyedan, lacustrine substratum	Very limited		Somewhat limited	
	Restricted permeability	0.94	Seepage	0.53
	Depth to saturated zone	0.43		

Table 14a.--Sanitary Facilities--Continued

Map symbol and component name	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
379B:				
Ocheyedan, lacustrine substratum	Very limited		Somewhat limited	
	Restricted permeability	0.94	Seepage	0.53
	Depth to saturated zone	0.43	Slope	0.32
379C2:				
Ocheyedan, lacustrine substratum, moderately eroded	Very limited		Very limited	
	Restricted permeability	0.94	Slope	1.00
	Depth to saturated zone	0.43	Seepage	0.53
384:				
Collinwood	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.96		
390:				
Waldorf	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.94		
397:				
Letri	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.92	Seepage	0.53
433E:				
Moneta	Very limited		Very limited	
	Slope	1.00	Slope	1.00
	Restricted permeability	0.24	Seepage	0.53
433F:				
Moneta	Very limited		Very limited	
	Slope	1.00	Slope	1.00
	Restricted permeability	0.24	Seepage	0.53
433G:				
Moneta	Very limited		Very limited	
	Slope	1.00	Slope	1.00
	Restricted permeability	0.24	Seepage	0.53

Table 14a.--Sanitary Facilities--Continued

Map symbol and component name	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
455:				
Wilmonton	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.92	Seepage	0.53
456:				
Wilmonton	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.92	Seepage	0.53
485:				
Spillville	Very limited		Very limited	
	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Flooding	1.00
	Restricted permeability	0.25	Seepage	1.00
506:				
Wacousta	Very limited		Very limited	
	Ponding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Ponding	1.00
	Restricted permeability	0.25	Seepage	0.50
507:				
Canisteo	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.25	Seepage	0.50
541C:				
Estherville	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
			Slope	1.00
Hawick	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
			Slope	1.00
559:				
Talcot	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Filtering capacity	1.00	Seepage	1.00
	Restricted permeability	0.24		
577B:				
Everly	Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.43	Seepage	0.53
	Restricted permeability	0.24	Slope	0.32

Table 14a.--Sanitary Facilities--Continued

Map symbol and component name	Septic tank absorption fields		Sewage lagoons	
	Rating class and limiting features	Value	Rating class and limiting features	Value
577C2:				
Everly, moderately eroded	Somewhat limited		Very limited	
	Depth to saturated zone	0.43	Slope	1.00
	Restricted permeability	0.24	Seepage	0.53
637D2:				
Everly, moderately eroded	Somewhat limited		Very limited	
	Slope	0.63	Slope	1.00
	Depth to saturated zone	0.43	Seepage	0.53
	Restricted permeability	0.24		
Moneta, moderately eroded	Somewhat limited		Very limited	
	Slope	0.63	Slope	1.00
	Restricted permeability	0.24	Seepage	0.53
638C2:				
Clarion, moderately eroded	Somewhat limited		Very limited	
	Depth to saturated zone	0.43	Slope	1.00
	Restricted permeability	0.25	Seepage	0.50
Storden, moderately eroded	Not limited		Very limited	
	Restricted permeability	0.25	Slope	1.00
			Seepage	0.50
672:				
May City	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
672B:				
May City	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
			Slope	0.32
672C2:				
May City, moderately eroded	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
			Slope	1.00
709:				
Fairhaven	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
	Restricted permeability	0.24		

Table 14a.--Sanitary Facilities--Continued

Map symbol and component name	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
733:				
Calco	Very limited		Very limited	
	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Flooding	1.00
	Restricted permeability	0.24	Seepage	0.53
735:				
Havelock	Very limited		Very limited	
	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Flooding	1.00
	Restricted permeability	0.24	Seepage	1.00
740D:				
Hawick	Very limited		Very limited	
	Filtering capacity	1.00	Slope	1.00
	Slope	0.63	Seepage	1.00
810:				
Galva, terrace	Not limited		Somewhat limited	
	Restricted permeability	0.24	Seepage	0.53
810B:				
Galva, terrace	Not limited		Somewhat limited	
	Restricted permeability	0.24	Seepage	0.53
			Slope	0.32
828B:				
Zenor	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
			Slope	0.32
828C2:				
Zenor, moderately eroded	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
			Slope	1.00
835D2:				
Storden, moderately eroded	Somewhat limited		Very limited	
	Slope	0.63	Slope	1.00
	Restricted permeability	0.25	Seepage	0.50
Omsrud, moderately eroded	Somewhat limited		Very limited	
	Slope	0.63	Slope	1.00
	Restricted permeability	0.25	Seepage	0.50
835E2:				
Storden, moderately eroded	Very limited		Very limited	
	Slope	1.00	Slope	1.00
	Restricted permeability	0.25	Seepage	0.50

Table 14a.--Sanitary Facilities--Continued

Map symbol and component name	Septic tank absorption fields: Rating class and limiting features	Value	Sewage lagoons: Rating class and limiting features	Value
835E2:				
Omsrud, moderately eroded	Very limited		Very limited	
	Slope	1.00	Slope	1.00
	Restricted permeability	0.25	Seepage	0.50
854D:				
Histosols, fens	Not rated		Not rated	
874:				
Dickinson, lacustrine substratum	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
	Restricted permeability	0.24		
874B:				
Dickinson, lacustrine substratum	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
			Slope	0.32
	Restricted permeability	0.24		
874C2:				
Dickinson, lacustrine substratum, moderately eroded	Very limited		Very limited	
	Filtering capacity	1.00	Seepage	1.00
			Slope	1.00
	Restricted permeability	0.24		
875:				
Roine	Somewhat limited		Very limited	
	Depth to saturated zone	0.43	Seepage	1.00
	Restricted permeability	0.24		
875B:				
Roine	Somewhat limited		Very limited	
	Depth to saturated zone	0.43	Seepage	1.00
			Slope	0.32
	Restricted permeability	0.24		
875C2:				
Roine, moderately eroded	Somewhat limited		Very limited	
	Depth to saturated zone	0.43	Seepage	1.00
			Slope	1.00
	Restricted permeability	0.24		

Table 14a.--Sanitary Facilities--Continued

Map symbol and component name	Septic tank absorption fields		Sewage lagoons	
	Rating class and limiting features	Value	Rating class and limiting features	Value
878:				
Ocheyedan	Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.43	Seepage	0.53
	Restricted permeability	0.24		
878B:				
Ocheyedan	Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.43	Seepage	0.53
			Slope	0.32
	Restricted permeability	0.24		
879:				
Fostoria	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.24	Seepage	0.53
928:				
Annieville	Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.43	Seepage	0.53
	Restricted permeability	0.25		
928B:				
Annieville	Somewhat limited		Somewhat limited	
	Depth to saturated zone	0.43	Seepage	0.53
			Slope	0.32
	Restricted permeability	0.25		
992:				
Gillett Grove	Very limited		Very limited	
	Ponding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Ponding	1.00
	Restricted permeability	0.92	Seepage	0.53
1053:				
Belmann, gypsum phase	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.94		
1091:				
McCreath	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.25	Seepage	0.53

Table 14a.--Sanitary Facilities--Continued

Map symbol and component name	Septic tank absorption fields		Sewage lagoons	
	Rating class and limiting features	Value	Rating class and limiting features	Value
1092:				
Gillett Grove	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.92	Seepage	0.53
1133:				
Colo	Very limited		Very limited	
	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Flooding	1.00
	Restricted permeability	0.24	Seepage	0.53
1259:				
Biscay, depressional	Very limited		Very limited	
	Ponding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Ponding	1.00
	Filtering capacity	1.00	Seepage	1.00
	Restricted permeability	0.25		
1385:				
Ocheda	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.96		
1508:				
Belmann	Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Restricted permeability	0.94		
1585:				
Spillville	Very limited		Very limited	
	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Flooding	1.00
	Restricted permeability	0.25	Seepage	1.00
Coland	Very limited		Very limited	
	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Flooding	1.00
	Restricted permeability	0.25	Seepage	1.00
5010:				
Pits, sand and gravel	Not rated		Not rated	
5040:				
Udorthents, loamy	Not rated		Not rated	

Table 14a.--Sanitary Facilities--Continued

Map symbol and component name	Septic tank absorption fields		Sewage lagoons	
	Rating class and limiting features	Value	Rating class and limiting features	Value
5060:				
Pits, clay	Not rated		Not rated	
AW:				
Animal waste	Not rated		Not rated	
SL:				
Sewage lagoon	Not rated		Not rated	
W:				
Water	Not rated		Not rated	

Table 14b.--Sanitary Facilities

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. "Not rated" indicates that data are not available or that no rating is applicable. See text for further explanation of ratings in this table)

Map symbol and component name	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
6:						
Okoboji	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Ponding	1.00	Hard to compact	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Ponding	1.00
	Too clayey	0.50			Depth to saturated zone	1.00
					Too clayey	0.50
27B:						
Terril	Very limited		Very limited		Not limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00		
27C:						
Terril	Very limited		Very limited		Not limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00		
27D:						
Terril	Very limited		Very limited		Somewhat limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Slope	0.63
	Slope	0.63	Slope	0.63		
31:						
Afton	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Hard to compact	1.00
	Too clayey	0.50			Depth to saturated zone	1.00
					Too clayey	0.50
34B:						
Estherville	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Too sandy	1.00
	Seepage	1.00			Seepage	1.00
41C:						
Sparta	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Too sandy	1.00
	Seepage	1.00			Seepage	1.00
48:						
Knoke	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Ponding	1.00	Hard to compact	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Ponding	1.00
	Too clayey	1.00			Depth to saturated zone	1.00
					Too clayey	0.50
54:						
Zook	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Hard to compact	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Too clayey	1.00			Too clayey	1.00

Table 14b.--Sanitary Facilities--Continued

Map symbol and component name	Trench sanitary landfill: Rating class and limiting features	Value	Area sanitary landfill: Rating class and limiting features	Value	Daily cover for landfill: Rating class and limiting features	Value
55:						
Nicollet	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
62F:						
Storden	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
77B:						
Sac	Very limited		Very limited		Somewhat limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	0.50
	Too clayey	0.50				
77C:						
Sac	Very limited		Very limited		Somewhat limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	0.50
	Too clayey	0.50				
77C2:						
Sac, moderately eroded	Very limited		Very limited		Somewhat limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	0.50
	Too clayey	0.50				
90:						
Okoboji mucky silty clay loam	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Ponding	1.00	Hard to compact	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Ponding	1.00
	Too clayey	0.50			Depth to saturated zone	1.00
					Too clayey	0.50
95:						
Harps	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
107:						
Webster	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
108:						
Wadena	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Too sandy	1.00
	Seepage	1.00			Seepage	1.00
108B:						
Wadena	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Too sandy	1.00
	Seepage	1.00			Seepage	1.00
133:						
Colo	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	0.50
	Too clayey	0.50				

Table 14b.--Sanitary Facilities--Continued

Map symbol and component name	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
135:						
Coland	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	0.50
	Seepage	1.00				
	Too clayey	0.50				
138B:						
Clarion	Very limited		Very limited		Not limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00		
138C2:						
Clarion, moderately eroded	Very limited		Very limited		Not limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00		
175:						
Dickinson	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Too sandy	1.00
	Seepage	1.00			Seepage	1.00
175B:						
Dickinson	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Too sandy	1.00
	Seepage	1.00			Seepage	1.00
191:						
Rushmore	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Too clayey	0.50			Too clayey	0.50
201B:						
Coland	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	0.50
	Seepage	1.00				
	Too clayey	0.50				
Terril	Very limited		Very limited		Not limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00		
202:						
Cylinder, 24 to 32 inches to sand and gravel	Very limited		Very limited		Very limited	
	Too sandy	1.00	Depth to saturated zone	1.00	Too sandy	1.00
	Depth to saturated zone	1.00	Seepage	1.00	Seepage	1.00
	Seepage	1.00			Depth to saturated zone	1.00

Table 14b.--Sanitary Facilities--Continued

Map symbol and component name	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
203:						
Cylinder, 32 to 40 inches to sand and gravel	Very limited		Very limited		Very limited	
	Too sandy	1.00	Depth to saturated zone	1.00	Seepage	1.00
	Depth to saturated zone	1.00	Seepage	1.00	Depth to saturated zone	1.00
	Seepage	1.00			Too sandy	0.50
221:						
Klossner	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Ponding	1.00	Ponding	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Too clayey	0.50	Seepage	1.00	Too clayey	0.50
259:						
Biscay	Very limited		Very limited		Very limited	
	Too sandy	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Seepage	1.00	Seepage	1.00
	Seepage	1.00			Too sandy	0.50
274:						
Rolfe	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Ponding	1.00	Hard to compact	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Ponding	1.00
	Too clayey	1.00			Depth to saturated zone	1.00
					Too clayey	1.00
282:						
Ransom	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
308:						
Wadena, 32 to 40 inches to sand and gravel	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Too sandy	1.00
	Seepage	1.00			Seepage	1.00
308B:						
Wadena, 32 to 40 inches to sand and gravel	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Too sandy	1.00
	Seepage	1.00			Seepage	1.00
354:						
Aquolls (marsh), ponded	Not rated		Not rated		Not rated	
375:						
Fostoria, lacustrine substratum	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00

Table 14b.--Sanitary Facilities--Continued

Map symbol and component name	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
376F:						
Cornell	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Slope	1.00	Slope	1.00
	Slope	1.00	Depth to saturated zone	1.00	Too clayey	0.50
	Too clayey	0.50				
379:						
Ocheyedan, lacustrine substratum	Very limited		Very limited		Not limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00		
379B:						
Ocheyedan, lacustrine substratum	Very limited		Very limited		Not limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00		
379C2:						
Ocheyedan, lacustrine substratum, moderately eroded	Very limited		Very limited		Not limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00		
384:						
Collinwood	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	1.00
	Too clayey	1.00			Depth to saturated zone	1.00
390:						
Waldorf	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Too clayey	1.00			Too clayey	0.50
397:						
Letri	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Too clayey	0.50			Too clayey	0.50
433E:						
Moneta	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
433F:						
Moneta	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
433G:						
Moneta	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
455:						
Wilmonton	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00

Table 14b.--Sanitary Facilities--Continued

Map symbol and component name	Trench sanitary landfill: Rating class and limiting features	Value	Area sanitary landfill: Rating class and limiting features	Value	Daily cover for landfill: Rating class and limiting features	Value
456:						
Wilmonton	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Too clayey	0.50			Too clayey	0.50
485:						
Spillville	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00		
	Seepage	1.00				
506:						
Wacousta	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Ponding	1.00	Ponding	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
507:						
Canisteo	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
541C:						
Estherville	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Too sandy	1.00
	Seepage	1.00			Seepage	1.00
Hawick	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Too sandy	1.00
	Seepage	1.00			Seepage	1.00
559:						
Talcot	Very limited		Very limited		Very limited	
	Too sandy	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Seepage	1.00	Too sandy	1.00
	Seepage	1.00			Seepage	1.00
577B:						
Everly	Very limited		Very limited		Somewhat limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	0.50
	Too clayey	0.50				
577C2:						
Everly, moderately eroded	Very limited		Very limited		Not limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00		
637D2:						
Everly, moderately eroded	Very limited		Very limited		Somewhat limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Slope	0.63
	Slope	0.63	Slope	0.63		
Moneta, moderately eroded	Somewhat limited		Somewhat limited		Somewhat limited	
	Slope	0.63	Slope	0.63	Slope	0.63

Table 14b.--Sanitary Facilities--Continued

Map symbol and component name	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
638C2:						
Clarion, moderately eroded	Very limited		Very limited		Not limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00		
Storden, moderately eroded	Not limited		Not limited		Not limited	
672:						
May City	Very limited		Very limited		Very limited	
	Seepage	1.00	Seepage	1.00	Seepage	1.00
					Gravel content	0.01
672B:						
May City	Very limited		Very limited		Very limited	
	Seepage	1.00	Seepage	1.00	Seepage	1.00
					Gravel content	0.01
672C2:						
May City, moderately eroded	Very limited		Very limited		Very limited	
	Seepage	1.00	Seepage	1.00	Seepage	1.00
					Gravel content	0.01
709:						
Fairhaven	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Seepage	1.00
	Seepage	1.00			Too sandy	0.50
733:						
Calco	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	0.50
	Too clayey	0.50				
735:						
Havelock	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Seepage	0.52
	Seepage	1.00			Too clayey	0.50
740D:						
Hawick	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Too sandy	1.00
	Seepage	1.00	Slope	0.63	Seepage	1.00
	Slope	0.63			Slope	0.63
810:						
Galva, terrace	Not limited		Not limited		Somewhat limited	
					Too clayey	0.50
810B:						
Galva, terrace	Not limited		Not limited		Somewhat limited	
					Too clayey	0.50
828B:						
Zenor	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Seepage	1.00
	Seepage	1.00			Too sandy	0.50

Table 14b.--Sanitary Facilities--Continued

Map symbol and component name	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
828C2:						
Zenor, moderately eroded	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Seepage	1.00
	Seepage	1.00			Too sandy	0.50
835D2:						
Storden, moderately eroded	Somewhat limited		Somewhat limited		Somewhat limited	
	Slope	0.63	Slope	0.63	Slope	0.63
Omsrud, moderately eroded	Somewhat limited		Somewhat limited		Somewhat limited	
	Slope	0.63	Slope	0.63	Slope	0.63
835E2:						
Storden, moderately eroded	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
Omsrud, moderately eroded	Very limited		Very limited		Very limited	
	Slope	1.00	Slope	1.00	Slope	1.00
854D:						
Histosols, fens	Not rated		Not rated		Not rated	
874:						
Dickinson, lacustrine substratum	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Too sandy	1.00
					Seepage	1.00
874B:						
Dickinson, lacustrine substratum	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Too sandy	1.00
					Seepage	1.00
874C2:						
Dickinson, lacustrine substratum, moderately eroded	Very limited		Very limited		Very limited	
	Too sandy	1.00	Seepage	1.00	Too sandy	1.00
					Seepage	1.00
875:						
Roine	Very limited		Very limited		Somewhat limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Seepage	0.52
			Seepage	1.00		
875B:						
Roine	Very limited		Very limited		Somewhat limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Seepage	0.52
			Seepage	1.00		

Table 14b.--Sanitary Facilities--Continued

Map symbol and component name	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
875C2:						
Roine, moderately eroded	Very limited		Very limited		Somewhat limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Seepage	0.52
			Seepage	1.00		
878:						
Ocheyedan	Very limited		Very limited		Not limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00		
878B:						
Ocheyedan	Very limited		Very limited		Not limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00		
879:						
Fostoria	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
928:						
Annieville	Very limited		Very limited		Somewhat limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	0.50
	Too clayey	0.50				
928B:						
Annieville	Very limited		Very limited		Somewhat limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	0.50
	Too clayey	0.50				
992:						
Gillett Grove	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Ponding	1.00	Ponding	1.00
	Ponding	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Too clayey	0.50			Too clayey	0.50
1053:						
Belmann, gypsum phase	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Too clayey	0.50			Too clayey	0.50
1091:						
McCreath	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Too clayey	0.50			Too clayey	0.50
1092:						
Gillett Grove	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Too clayey	0.50			Too clayey	0.50

Table 14b.--Sanitary Facilities--Continued

Map symbol and component name	Trench sanitary landfill		Area sanitary landfill		Daily cover for landfill	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1133:						
Colo	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	0.50
	Too clayey	0.50				
1259:						
Biscay, depressional	Very limited		Very limited		Very limited	
	Too sandy	1.00	Ponding	1.00	Ponding	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Ponding	1.00	Seepage	1.00	Seepage	1.00
	Seepage	1.00			Too sandy	0.50
1385:						
Ocheda	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Too clayey	0.50			Too clayey	0.50
1508:						
Belmann	Very limited		Very limited		Very limited	
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
	Too clayey	1.00			Too clayey	1.00
1585:						
Spillville	Very limited		Very limited		Somewhat limited	
	Flooding	1.00	Flooding	1.00	Depth to saturated zone	0.86
	Depth to saturated zone	1.00	Depth to saturated zone	1.00		
	Seepage	1.00				
Coland	Very limited		Very limited		Very limited	
	Flooding	1.00	Flooding	1.00	Depth to saturated zone	1.00
	Depth to saturated zone	1.00	Depth to saturated zone	1.00	Too clayey	0.50
	Seepage	1.00	Seepage	1.00		
	Too clayey	0.50				
5010:						
Pits, sand and gravel	Not rated		Not rated		Not rated	
5040:						
Udorthents, loamy	Not rated		Not rated		Not rated	
5060:						
Pits, clay	Not rated		Not rated		Not rated	
AW:						
Animal waste	Not rated		Not rated		Not rated	
SL:						
Sewage lagoon	Not rated		Not rated		Not rated	
W:						
Water	Not rated		Not rated		Not rated	

Table 15.--Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.00 to 0.99. The smaller the value, the greater the potential limitation. "Not rated" indicates that data are not available or that no rating is applicable. See text for further explanation of ratings in this table)

Map symbol and component name	Potential as source of gravel: Rating class	Value	Potential as source of sand: Rating class	Value	Potential as source of topsoil: Rating class and limiting features	Value
6:						
Okoboji	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00	Depth to saturated zone	0.00
27B:						
Terril	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		
27C:						
Terril	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		
27D:						
Terril	Improbable		Poor		Fair	
	Thickest layer	0.00	Bottom layer	0.00	Slope	0.37
	Bottom layer	0.00	Thickest layer	0.00		
31:						
Afton	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00	Depth to saturated zone	0.00
34B:						
Estherville	Possible		Fair		Poor	
	Thickest layer	0.00	Thickest layer	0.03	Too sandy	0.00
	Bottom layer	0.04	Bottom layer	0.69	Rock fragments	0.00
					Hard to reclaim	0.82
41C:						
Sparta	Improbable		Fair		Poor	
	Thickest layer	0.00	Thickest layer	0.10	Too sandy	0.00
	Bottom layer	0.00	Bottom layer	0.34		
48:						
Knoke	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.00	Thickest layer	0.00		
					Too clayey	0.00
					Carbonate content	0.97
54:						
Zook	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00	Depth to saturated zone	0.00
55:						
Nicollet	Improbable		Poor		Fair	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.89
	Bottom layer	0.00	Thickest layer	0.00		

Table 15.--Construction Materials--Continued

Map symbol and component name	Potential as source of gravel: Rating class	Value	Potential as source of sand: Rating class	Value	Potential as source of topsoil: Rating class and limiting features	Value
62F:						
Storden	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Slope	0.00
	Bottom layer	0.00	Thickest layer	0.00	Carbonate content	0.97
77B:						
Sac	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00		
77C:						
Sac	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00		
77C2:						
Sac, moderately eroded	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00		
90:						
Okoboji mucky silty clay loam	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00	Depth to saturated zone	0.00
95:						
Harps	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.00	Thickest layer	0.00	Carbonate content	0.68
107:						
Webster	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.00	Thickest layer	0.00		
108:						
Wadena	Possible		Poor		Fair	
	Thickest layer	0.00	Bottom layer	0.00	Hard to reclaim	0.82
	Bottom layer	0.04	Thickest layer	0.00		
108B:						
Wadena	Possible		Poor		Fair	
	Thickest layer	0.00	Bottom layer	0.00	Hard to reclaim	0.82
	Bottom layer	0.04	Thickest layer	0.00		
133:						
Colo	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.00	Thickest layer	0.00	Too clayey	0.00
135:						
Coland	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.00	Thickest layer	0.00	Too clayey	0.00

Table 15.--Construction Materials--Continued

Map symbol and component name	Potential as source of gravel: Rating class	Value	Potential as source of sand: Rating class	Value	Potential as source of topsoil: Rating class and limiting features	Value
138B:						
Clarion	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		
138C2:						
Clarion, moderately eroded	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		
175:						
Dickinson	Improbable		Fair		Good	
	Thickest layer	0.00	Thickest layer	0.00		
	Bottom layer	0.00	Bottom layer	0.36		
175B:						
Dickinson	Improbable		Fair		Good	
	Thickest layer	0.00	Thickest layer	0.00		
	Bottom layer	0.00	Bottom layer	0.36		
191:						
Rushmore	Not rated		Not rated		Poor	
					Depth to saturated zone	0.00
201B:						
Coland	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.00	Thickest layer	0.00		
					Too clayey	0.00
Terril	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		
202:						
Cylinder, 24 to 32 inches to sand and gravel	Possible		Fair		Poor	
	Thickest layer	0.00	Thickest layer	0.00	Too sandy	0.00
	Bottom layer	0.04	Bottom layer	0.36	Rock fragments	0.02
					Depth to saturated zone	0.89
					Hard to reclaim	0.97
203:						
Cylinder, 32 to 40 inches to sand and gravel	Possible		Fair		Poor	
	Thickest layer	0.00	Thickest layer	0.00	Too sandy	0.01
	Bottom layer	0.04	Bottom layer	0.10	Rock fragments	0.04
					Depth to saturated zone	0.89
					Hard to reclaim	0.99
221:						
Klossner	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.00	Thickest layer	0.00		
					Content of organic matter	0.00

Table 15.--Construction Materials--Continued

Map symbol and component name	Potential as source of gravel: Rating class	Value	Potential as source of sand: Rating class	Value	Potential as source of topsoil: Rating class and limiting features	Value
259:						
Biscay	Possible		Poor		Poor	
	Thickest layer	0.00	Thickest layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.04	Bottom layer	0.09	Hard to reclaim	0.68
274:						
Rolfe	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00	Depth to saturated zone	0.00
282:						
Ransom	Not rated		Not rated		Poor	
					Too clayey	0.00
					Depth to saturated zone	0.89
308:						
Wadena, 32 to 40 inches to sand and gravel	Possible		Poor		Fair	
	Thickest layer	0.00	Thickest layer	0.00	Hard to reclaim	0.82
	Bottom layer	0.04	Bottom layer	0.09		
308B:						
Wadena, 32 to 40 inches to sand and gravel	Possible		Poor		Fair	
	Thickest layer	0.00	Thickest layer	0.00	Hard to reclaim	0.82
	Bottom layer	0.04	Bottom layer	0.09		
354:						
Aquolls (marsh), ponded	Not rated		Not rated		Not rated	
375:						
Fostoria, lacustrine substratum	Improbable		Poor		Fair	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.89
	Bottom layer	0.00	Thickest layer	0.00		
376F:						
Cornell	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Slope	0.00
	Bottom layer	0.00	Thickest layer	0.00	Too clayey	0.00
379:						
Ocheyedan, lacustrine substratum	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		
379B:						
Ocheyedan, lacustrine substratum	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		

Table 15.--Construction Materials--Continued

Map symbol and component name	Potential as source of gravel: Rating class	Value	Potential as source of sand: Rating class	Value	Potential as source of topsoil: Rating class and limiting features	Value
379C2:						
Ocheyedan, lacustrine substratum, moderately eroded	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		
384:						
Collinwood	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00	Depth to saturated zone	0.89
390:						
Waldorf	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00	Depth to saturated zone	0.00
397:						
Letri	Not rated		Not rated		Poor	
					Depth to saturated zone	0.00
433E:						
Moneta	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Slope	0.00
	Bottom layer	0.00	Thickest layer	0.00	Carbonate content	0.80
433F:						
Moneta	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Slope	0.00
	Bottom layer	0.00	Thickest layer	0.00	Carbonate content	0.80
433G:						
Moneta	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Slope	0.00
	Bottom layer	0.00	Thickest layer	0.00	Carbonate content	0.80
455:						
Wilmonton	Not rated		Not rated		Fair	
					Depth to saturated zone	0.89
					Carbonate content	0.99
456:						
Wilmonton	Not rated		Not rated		Fair	
					Depth to saturated zone	0.89
485:						
Spillville	Improbable		Poor		Fair	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.89
	Bottom layer	0.00	Thickest layer	0.00		
506:						
Wacousta	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.00	Thickest layer	0.00	Carbonate content	0.97

Table 15.--Construction Materials--Continued

Map symbol and component name	Potential as source of gravel: Rating class	Value	Potential as source of sand: Rating class	Value	Potential as source of topsoil: Rating class and limiting features	Value
507:						
Canisteo------------	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.00	Thickest layer	0.00		
541C:						
Estherville---------	Possible		Fair		Poor	
	Thickest layer	0.00	Thickest layer	0.03	Too sandy	0.00
	Bottom layer	0.04	Bottom layer	0.45	Rock fragments	0.00
					Hard to reclaim	0.82
Hawick--------------	Possible		Fair		Poor	
	Thickest layer	0.00	Thickest layer	0.10	Too sandy	0.00
	Bottom layer	0.04	Bottom layer	0.50	Rock fragments	0.03
					Hard to reclaim	0.98
559:						
Talcot--------------	Possible		Fair		Poor	
	Thickest layer	0.00	Thickest layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.04	Bottom layer	0.75		
					Too clayey	0.00
					Hard to reclaim	0.82
					Carbonate content	0.97
577B:						
Everly--------------	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		
577C2:						
Everly, moderately eroded------------	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		
637D2:						
Everly, moderately eroded------------	Improbable		Poor		Fair	
	Thickest layer	0.00	Bottom layer	0.00	Slope	0.37
	Bottom layer	0.00	Thickest layer	0.00		
Moneta, moderately eroded------------	Improbable		Poor		Fair	
	Thickest layer	0.00	Bottom layer	0.00	Slope	0.37
	Bottom layer	0.00	Thickest layer	0.00	Carbonate content	0.80
638C2:						
Clarion, moderately eroded------------	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		
Storden, moderately eroded------------	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00	Carbonate content	0.97
	Bottom layer	0.00	Thickest layer	0.00		
672:						
May City------------	Possible		Poor		Poor	
	Thickest layer	0.00	Thickest layer	0.00	Rock fragments	0.00
	Bottom layer	0.12	Bottom layer	0.02	Hard to reclaim	0.68

Table 15.--Construction Materials--Continued

Map symbol and component name	Potential as source of gravel: Rating class	Value	Potential as source of sand: Rating class	Value	Potential as source of topsoil: Rating class and limiting features	Value
672B:						
May City	Possible		Poor		Poor	
	Thickest layer	0.00	Thickest layer	0.00	Rock fragments	0.00
	Bottom layer	0.12	Bottom layer	0.02	Hard to reclaim	0.68
672C2:						
May City, moderately eroded	Possible		Poor		Poor	
	Thickest layer	0.00	Thickest layer	0.00	Rock fragments	0.00
	Bottom layer	0.12	Bottom layer	0.02	Hard to reclaim	0.68
709:						
Fairhaven	Possible		Poor		Fair	
	Thickest layer	0.00	Thickest layer	0.00	Hard to reclaim	0.68
	Bottom layer	0.01	Bottom layer	0.08		
733:						
Calco	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.00	Thickest layer	0.00	Too clayey	0.00
					Carbonate content	0.97
735:						
Havelock	Improbable		Poor		Poor	
	Thickest layer	0.00	Thickest layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.00	Bottom layer	0.03	Too clayey	0.00
					Carbonate content	0.97
740D:						
Hawick	Possible		Fair		Poor	
	Thickest layer	0.00	Thickest layer	0.10	Too sandy	0.00
	Bottom layer	0.04	Bottom layer	0.50	Rock fragments	0.03
					Slope	0.37
					Hard to reclaim	0.98
810:						
Galva, terrace	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00		
810B:						
Galva, terrace	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00		
828B:						
Zenor	Improbable		Poor		Good	
	Thickest layer	0.00	Thickest layer	0.03	Rock fragments	0.97
	Bottom layer	0.00	Bottom layer	0.09		
828C2:						
Zenor, moderately eroded	Improbable		Poor		Good	
	Thickest layer	0.00	Thickest layer	0.03	Rock fragments	0.97
	Bottom layer	0.00	Bottom layer	0.09		
835D2:						
Storden, moderately eroded	Improbable		Poor		Fair	
	Thickest layer	0.00	Bottom layer	0.00	Slope	0.37
	Bottom layer	0.00	Thickest layer	0.00	Carbonate content	0.97

Table 15.--Construction Materials--Continued

Map symbol and component name	Potential as source of gravel: Rating class	Value	Potential as source of sand: Rating class	Value	Potential as source of topsoil: Rating class and limiting features	Value
835D2:						
Omsrud, moderately eroded	Improbable		Poor		Fair	
	Thickest layer	0.00	Bottom layer	0.00	Slope	0.37
	Bottom layer	0.00	Thickest layer	0.00		
835E2:						
Storden, moderately eroded	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Slope	0.00
	Bottom layer	0.00	Thickest layer	0.00	Carbonate content	0.97
Omsrud, moderately eroded	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Slope	0.00
	Bottom layer	0.00	Thickest layer	0.00		
854D:						
Histosols, fens	Not rated		Not rated		Not rated	
874:						
Dickinson, lacustrine substratum	Improbable		Fair		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.36		
874B:						
Dickinson, lacustrine substratum	Improbable		Fair		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.36		
874C2:						
Dickinson, lacustrine substratum, moderately eroded	Improbable		Fair		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.36		
875:						
Roine	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.01		
875B:						
Roine	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.01		
875C2:						
Roine, moderately eroded	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.01		
878:						
Ocheyedan	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		

Table 15.--Construction Materials--Continued

Map symbol and component name	Potential as source of gravel: Rating class	Value	Potential as source of sand: Rating class	Value	Potential as source of topsoil: Rating class and limiting features	Value
878B:						
Ocheyedan	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		
879:						
Fostoria	Improbable		Poor		Fair	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.89
	Bottom layer	0.00	Thickest layer	0.00		
928:						
Annieville	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		
928B:						
Annieville	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		
992:						
Gillett Grove	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.00	Thickest layer	0.00		
					Too clayey	0.00
1053:						
Belmann, gypsum phase	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00	Depth to saturated zone	0.00
1091:						
McCreath	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00	Depth to saturated zone	0.89
1092:						
Gillett Grove	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.00	Thickest layer	0.00		
					Too clayey	0.00
1133:						
Colo	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.00	Thickest layer	0.00		
					Too clayey	0.00
1259:						
Biscay, depressional	Not rated		Not rated		Poor	
					Depth to saturated zone	0.00
					Hard to reclaim	0.68
1385:						
Ocheda	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00	Depth to saturated zone	0.89

Table 15.--Construction Materials--Continued

Map symbol and component name	Potential as source of gravel		Potential as source of sand		Potential as source of topsoil	
	Rating class	Value	Rating class	Value	Rating class and limiting features	Value
1508:						
Belmann	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Too clayey	0.00
	Bottom layer	0.00	Thickest layer	0.00	Depth to saturated zone	0.00
1585:						
Spillville	Improbable		Poor		Good	
	Thickest layer	0.00	Bottom layer	0.00		
	Bottom layer	0.00	Thickest layer	0.00		
Coland	Improbable		Poor		Poor	
	Thickest layer	0.00	Bottom layer	0.00	Depth to saturated zone	0.00
	Bottom layer	0.00	Thickest layer	0.00	Too clayey	0.00
5010:						
Pits, sand and gravel	Not rated		Not rated		Not rated	
5040:						
Udorthents, loamy	Not rated		Not rated		Not rated	
5060:						
Pits, clay	Not rated		Not rated		Not rated	
AW:						
Animal waste	Not rated		Not rated		Not rated	
SL:						
Sewage lagoon	Not rated		Not rated		Not rated	
W:						
Water	Not rated		Not rated		Not rated	

Table 16.--Water Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. "Not rated" indicates that data are not available or that no rating is applicable. See text for further explanation of ratings in this table)

Map symbol and component name	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
6:						
Okoboji	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.70	Ponding	1.00	Slow refill	0.30
			Depth to saturated zone	1.00	Cutbanks cave	0.10
			Hard to pack	0.84		
27B:						
Terril	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.70	Piping	0.46	Depth to water	1.00
27C:						
Terril	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.46	Depth to water	1.00
27D:						
Terril	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.46	Depth to water	1.00
	Slope	0.01				
31:						
Afton	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.72	Depth to saturated zone	1.00	Slow refill	0.28
					Cutbanks cave	0.10
34B:						
Estherville	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.69	Depth to water	1.00
41C:						
Sparta	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.34	Depth to water	1.00
48:						
Knoke	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.05	Ponding	1.00	Slow refill	0.95
			Depth to saturated zone	1.00	Cutbanks cave	0.10
			Hard to pack	0.59		
54:						
Zook	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.05	Depth to saturated zone	1.00	Slow refill	0.95
					Cutbanks cave	0.10
			Hard to pack	1.00		
55:						
Nicollet	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.70	Depth to saturated zone	1.00	Slow refill	0.30
					Cutbanks cave	0.10
			Piping	0.97		
62F:						
Storden	Somewhat limited		Very limited		Very limited	
	Seepage	0.70	Piping	1.00	Depth to water	1.00
	Slope	0.18				

Table 16.--Water Management--Continued

Map symbol and component name	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
77B:						
Sac	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.41	Depth to water	1.00
77C:						
Sac	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.41	Depth to water	1.00
77C2:						
Sac, moderately eroded	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.44	Depth to water	1.00
90:						
Okoboji mucky silty clay loam	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.70	Ponding	1.00	Slow refill	0.30
			Depth to saturated zone	1.00	Cutbanks cave	0.10
			Hard to pack	0.47		
95:						
Harps	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.70	Depth to saturated zone	1.00	Slow refill	0.30
					Cutbanks cave	0.10
107:						
Webster	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.70	Depth to saturated zone	1.00	Slow refill	0.30
					Cutbanks cave	0.10
			Piping	0.22		
108:						
Wadena	Very limited		Not limited		Very limited	
	Seepage	1.00			Depth to water	1.00
108B:						
Wadena	Very limited		Not limited		Very limited	
	Seepage	1.00			Depth to water	1.00
133:						
Colo	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.72	Depth to saturated zone	1.00	Slow refill	0.28
					Cutbanks cave	0.10
135:						
Coland	Very limited		Very limited		Somewhat limited	
	Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	0.10
			Piping	0.22		
138B:						
Clarion	Somewhat limited		Very limited		Very limited	
	Seepage	0.70	Piping	1.00	Depth to water	1.00
138C2:						
Clarion, moderately eroded	Somewhat limited		Very limited		Very limited	
	Seepage	0.70	Piping	1.00	Depth to water	1.00

Table 16.--Water Management--Continued

Map symbol and component name	Pond reservoir areas: Rating class and limiting features	Value	Embankments, dikes, and levees: Rating class and limiting features	Value	Aquifer-fed excavated ponds: Rating class and limiting features	Value
175:						
Dickinson	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.36	Depth to water	1.00
175B:						
Dickinson	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.36	Depth to water	1.00
191:						
Rushmore	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.72	Depth to saturated zone	1.00	Slow refill	0.28
					Cutbanks cave	0.10
			Piping	0.10		
201B:						
Coland	Very limited		Very limited		Somewhat limited	
	Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	0.10
			Piping	0.22		
Terril	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.70	Piping	0.46	Depth to water	1.00
202:						
Cylinder, 24 to 32 inches to sand and gravel	Very limited		Very limited		Very limited	
	Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	1.00
			Seepage	0.36		
203:						
Cylinder, 32 to 40 inches to sand and gravel	Very limited		Very limited		Very limited	
	Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	1.00
			Seepage	0.10		
221:						
Klossner	Very limited		Very limited		Somewhat limited	
	Seepage	1.00	Ponding	1.00	Cutbanks cave	0.10
			Depth to saturated zone	1.00		
259:						
Biscay	Very limited		Very limited		Very limited	
	Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	1.00
			Seepage	0.09		
274:						
Rolfe	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.70	Ponding	1.00	Slow refill	0.30
			Depth to saturated zone	1.00	Cutbanks cave	0.10
282:						
Ransom	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.72	Depth to saturated zone	1.00	Slow refill	0.28
					Cutbanks cave	0.10
			Piping	0.91		

Table 16.--Water Management--Continued

Map symbol and component name	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
308:						
Wadena, 32 to 40 inches to sand and gravel	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.09	Depth to water	1.00
308B:						
Wadena, 32 to 40 inches to sand and gravel	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.09	Depth to water	1.00
354:						
Aquolls (marsh), ponded	Not limited		Not rated		Not rated	
375:						
Fostoria, lacustrine substratum	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.72	Depth to saturated zone	1.00	Slow refill	0.28
					Cutbanks cave	0.10
			Piping	0.10		
376F:						
Cornell	Somewhat limited		Not limited		Very limited	
	Seepage	0.72			Depth to water	1.00
	Slope	0.18				
379:						
Ocheyedan, lacustrine substratum	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.74	Depth to water	1.00
379B:						
Ocheyedan, lacustrine substratum	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.74	Depth to water	1.00
379C2:						
Ocheyedan, lacustrine substratum, moderately eroded	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.77	Depth to water	1.00
384:						
Collinwood	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.02	Depth to saturated zone	1.00	Slow refill	0.98
					Cutbanks cave	0.10
			Hard to pack	0.06		
390:						
Waldorf	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.02	Depth to saturated zone	1.00	Slow refill	0.98
					Cutbanks cave	0.10
			Hard to pack	0.03		

Table 16.--Water Management--Continued

Map symbol and component name	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
397:						
Letri	Somewhat limited		Very limited		Very limited	
	Seepage	0.72	Depth to saturated zone	1.00	Cutbanks cave	1.00
					Slow refill	0.28
			Piping	0.07		
433E:						
Moneta	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.71	Depth to water	1.00
	Slope	0.04				
433F:						
Moneta	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.71	Depth to water	1.00
	Slope	0.18				
433G:						
Moneta	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.71	Depth to water	1.00
	Slope	0.64				
455:						
Wilmonton	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.04	Depth to saturated zone	1.00	Slow refill	0.96
					Cutbanks cave	0.10
			Piping	0.08		
456:						
Wilmonton	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.04	Depth to saturated zone	1.00	Slow refill	0.96
					Cutbanks cave	0.10
			Piping	0.06		
485:						
Spillville	Very limited		Very limited		Somewhat limited	
	Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	0.10
			Piping	0.77		
506:						
Wacousta	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.70	Ponding	1.00	Slow refill	0.30
			Depth to saturated zone	1.00	Cutbanks cave	0.10
			Piping	0.44		
507:						
Canisteo	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.70	Depth to saturated zone	1.00	Slow refill	0.30
					Cutbanks cave	0.10
			Piping	0.19		
541C:						
Estherville	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.45	Depth to water	1.00
Hawick	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.50	Depth to water	1.00

Table 16.--Water Management--Continued

Map symbol and component name	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
559:						
Talcot	Very limited		Very limited		Very limited	
	Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	1.00
			Seepage	0.75		
577B:						
Everly	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.34	Depth to water	1.00
577C2:						
Everly, moderately eroded	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.29	Depth to water	1.00
637D2:						
Everly, moderately eroded	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.29	Depth to water	1.00
	Slope	0.01				
Moneta, moderately eroded	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.72	Depth to water	1.00
	Slope	0.01				
638C2:						
Clarion, moderately eroded	Somewhat limited		Very limited		Very limited	
	Seepage	0.70	Piping	1.00	Depth to water	1.00
Storden, moderately eroded	Somewhat limited		Very limited		Very limited	
	Seepage	0.70	Piping	1.00	Depth to water	1.00
672:						
May City	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.02	Depth to water	1.00
672B:						
May City	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.02	Depth to water	1.00
672C2:						
May City, moderately eroded	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.02	Depth to water	1.00
709:						
Fairhaven	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.08	Depth to water	1.00
733:						
Calco	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.72	Depth to saturated zone	1.00	Slow refill	0.28
					Cutbanks cave	0.10
			Piping	0.05		

Table 16.--Water Management--Continued

Map symbol and component name	Pond reservoir areas: Rating class and limiting features	Value	Embankments, dikes, and levees: Rating class and limiting features	Value	Aquifer-fed excavated ponds: Rating class and limiting features	Value
735:						
Havelock	Very limited		Very limited		Somewhat limited	
	Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	0.10
			Piping	0.06		
			Seepage	0.03		
740D:						
Hawick	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.50	Depth to water	1.00
	Slope	0.01				
810:						
Galva, terrace	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.03	Depth to water	1.00
810B:						
Galva, terrace	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.03	Depth to water	1.00
828B:						
Zenor	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.09	Depth to water	1.00
828C2:						
Zenor, moderately eroded	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.09	Depth to water	1.00
835D2:						
Storden, moderately eroded	Somewhat limited		Very limited		Very limited	
	Seepage	0.70	Piping	1.00	Depth to water	1.00
	Slope	0.01				
Omsrud, moderately eroded	Somewhat limited		Very limited		Very limited	
	Seepage	0.70	Piping	1.00	Depth to water	1.00
	Slope	0.01				
835E2:						
Storden, moderately eroded	Somewhat limited		Very limited		Very limited	
	Seepage	0.70	Piping	1.00	Depth to water	1.00
	Slope	0.04				
Omsrud, moderately eroded	Somewhat limited		Very limited		Very limited	
	Seepage	0.70	Piping	1.00	Depth to water	1.00
	Slope	0.04				
854D:						
Histosols, fens	Somewhat limited		Not rated		Not rated	
	Slope	0.03				
874:						
Dickinson, lacustrine substratum	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.36	Depth to water	1.00

Table 16.--Water Management--Continued

Map symbol and component name	Pond reservoir areas: Rating class and limiting features	Value	Embankments, dikes, and levees: Rating class and limiting features	Value	Aquifer-fed excavated ponds: Rating class and limiting features	Value
874B:						
Dickinson, lacustrine substratum	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.36	Depth to water	1.00
874C2:						
Dickinson, lacustrine substratum, moderately eroded	Very limited		Somewhat limited		Very limited	
	Seepage	1.00	Seepage	0.36	Depth to water	1.00
875:						
Roine	Very limited		Very limited		Very limited	
	Seepage	1.00	Piping	1.00	Depth to water	1.00
			Seepage	0.01		
875B:						
Roine	Very limited		Very limited		Very limited	
	Seepage	1.00	Piping	1.00	Depth to water	1.00
			Seepage	0.01		
875C2:						
Roine, moderately eroded	Very limited		Very limited		Very limited	
	Seepage	1.00	Piping	1.00	Depth to water	1.00
			Seepage	0.01		
878:						
Ocheyedan	Somewhat limited		Very limited		Very limited	
	Seepage	0.72	Piping	0.99	Depth to water	1.00
878B:						
Ocheyedan	Somewhat limited		Very limited		Very limited	
	Seepage	0.72	Piping	0.99	Depth to water	1.00
879:						
Fostoria	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.72	Depth to saturated zone	1.00	Slow refill	0.28
					Cutbanks cave	0.10
			Piping	0.58		
928:						
Annieville	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.06	Depth to water	1.00
928B:						
Annieville	Somewhat limited		Somewhat limited		Very limited	
	Seepage	0.72	Piping	0.06	Depth to water	1.00
992:						
Gillett Grove	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.72	Ponding	1.00	Slow refill	0.28
			Depth to saturated zone	1.00	Cutbanks cave	0.10
1053:						
Belmann, gypsum phase	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.04	Depth to saturated zone	1.00	Slow refill	0.96
					Cutbanks cave	0.10
			Piping	0.50		

Table 16.--Water Management--Continued

Map symbol and component name	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1091:						
McCreath	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.72	Depth to saturated zone	1.00	Slow refill	0.28
					Cutbanks cave	0.10
			Piping	0.16		
1092:						
Gillett Grove	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.72	Depth to saturated zone	1.00	Slow refill	0.28
					Cutbanks cave	0.10
1133:						
Colo	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.72	Depth to saturated zone	1.00	Slow refill	0.28
					Cutbanks cave	0.10
1259:						
Biscay, depressional	Very limited		Very limited		Very limited	
	Seepage	1.00	Ponding	1.00	Cutbanks cave	1.00
			Depth to saturated zone	1.00		
			Seepage	0.09		
1385:						
Ocheda	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.05	Depth to saturated zone	1.00	Slow refill	0.95
					Cutbanks cave	0.10
1508:						
Belmann	Somewhat limited		Very limited		Somewhat limited	
	Seepage	0.04	Depth to saturated zone	1.00	Slow refill	0.96
					Cutbanks cave	0.10
			Hard to pack	0.02		
1585:						
Spillville	Very limited		Very limited		Somewhat limited	
	Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	0.10
					Depth to water	0.01
			Piping	0.83		
Coland	Very limited		Very limited		Somewhat limited	
	Seepage	1.00	Depth to saturated zone	1.00	Cutbanks cave	0.10
			Piping	0.24		
5010:						
Pits, sand and gravel	Not rated		Not rated		Not rated	
5040:						
Udorthents, loamy	Not rated		Not rated		Not rated	
5060:						
Pits, clay	Not rated		Not rated		Not rated	
AW:						
Animal waste	Not rated		Not rated		Not rated	
SL:						
Sewage lagoon	Not rated		Not rated		Not rated	

Table 16.--Water Management--Continued

Map symbol and component name	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
	Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
W:						
Water	Not rated		Not rated		Not rated	

Table 17.--Engineering Index Properties

(Absence of an entry indicates that the data were not estimated)

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
6:												
Okoboji---------	0-6	Silty clay loam	CH	A-7	0	0	100	100	90-100	80-95	55-65	30-40
	6-32	Silty clay loam	CH	A-7	0	0	100	100	90-100	80-95	55-65	30-40
	32-56	Silty clay loam, silty clay	CH	A-7	0	0	100	100	90-100	80-95	55-65	30-40
	56-60	Loam, silty clay loam	CL, CH	A-7	0	0	100	100	90-100	75-90	45-55	20-30
27B:												
Terril----------	0-9	Loam	CL	A-6	0	0-5	95-100	95-100	70-90	60-80	30-40	10-20
	9-36	Clay loam, loam	CL	A-6	0	0-5	95-100	95-100	70-90	60-80	30-40	10-20
	36-50	Loam, clay loam	CL	A-7, A-6	0	0-5	95-100	90-100	70-90	60-80	30-45	10-25
	50-60	Clay loam, loam	CL-ML, CL, SC-SM, SC	A-6, A-4	0	0-5	95-100	90-100	65-95	35-85	20-40	5-20
27C:												
Terril----------	0-9	Loam	CL	A-6	0	0-5	95-100	95-100	70-90	60-80	30-40	10-20
	9-36	Clay loam, loam	CL	A-6	0	0-5	95-100	95-100	70-90	60-80	30-40	10-20
	36-50	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	70-90	60-80	30-45	10-25
	50-60	Loam, clay loam	SC, SC-SM, CL-ML, CL	A-6	0	0-5	95-100	90-100	65-95	35-85	20-40	5-20
27D:												
Terril----------	0-9	Loam	CL	A-6	0	0-5	95-100	95-100	70-90	60-80	30-40	10-20
	9-36	Clay loam, loam	CL	A-6	0	0-5	95-100	95-100	70-90	60-80	30-40	10-20
	36-50	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	70-90	60-80	30-45	10-25
	50-60	Clay loam, loam	CL, CL-ML, SC, SC-SM	A-6	0	0-5	95-100	90-100	65-95	35-85	20-40	5-20
31:												
Afton-----------	0-7	Silty clay loam	MH	A-7	0	0	100	100	100	95-100	50-65	20-35
	7-32	Silty clay loam	MH	A-7	0	0	100	100	100	95-100	50-65	20-35
	32-43	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-60	20-35
	51-65	Clay loam	CL	A-7	0	0	100	95-100	80-100	60-90	35-50	20-30
	65-80	Loam, clay loam	CL	A-6	0	0-5	90-100	85-95	75-85	60-80	30-40	10-20

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
34B:												
Estherville-----	0-7	Sandy loam	SM, SC, SC-SM	A-2, A-4	0	0-5	90-100	80-100	50-75	25-50	20-30	2-10
	7-18	Sandy loam, loam, coarse sandy loam	SM, SC-SM, SC	A-1, A-4, A-2	0	0-5	85-100	80-95	40-75	15-45	20-30	2-8
	18-80	Gravelly coarse sand, very gravelly sand, loamy coarse sand	SP, SM, GP, SP-SM	A-1	0	0-10	55-90	50-85	10-40	2-25	---	NP
41C:												
Sparta----------	0-11	Loamy sand	SM	A-2	0	0	85-100	85-100	35-95	15-50	0-14	NP
	11-15	Loamy fine sand, loamy sand	SM	A-2	0	0	85-100	85-100	50-95	5-50	0-14	NP
	15-60	Fine sand, sand	SM	A-2	0	0	85-100	85-100	50-95	2-30	0-14	NP
48:												
Knoke-----------	0-8	Mucky silty clay loam	CH, MH	A-7	0	0	100	100	90-100	80-95	55-70	25-40
	8-15	Silty clay loam	CH, MH	A-7	0	0	100	100	90-100	80-95	55-70	25-40
	15-39	Silty clay loam, mucky silty clay loam	MH, OH	A-7	0	0	100	100	90-100	80-95	55-90	15-40
	39-80	Silty clay, silty clay loam, clay loam, loam	CH, MH	A-7	0	0	95-100	95-100	90-100	80-95	55-70	25-40
54:												
Zook------------	0-6	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	95-100	45-65	20-35
	6-20	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	95-100	45-65	20-35
	20-60	Silty clay, silty clay loam	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-55
55:												
Nicollet--------	0-10	Loam	CL	A-6	0-1	0-5	95-100	95-100	75-90	55-80	25-40	5-15
	10-17	Clay loam, loam	CL	A-6	0-1	0-5	95-100	95-100	75-90	55-80	25-40	5-15
	17-36	Clay loam, loam	CL	A-6	0-1	0-5	90-100	90-100	75-90	50-80	25-40	5-15
	36-60	Loam, sandy loam	CL-ML, SC-SM, SC, CL	A-4, A-6	0-1	0-5	90-100	85-100	75-90	45-70	25-40	5-15

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
62F:												
Storden---------	0-7	Loam	CL, ML	A-4, A-6	0	0-5	95-100	95-100	70-85	55-70	30-40	5-15
	7-55	Loam, clay loam	CL, CL-ML	A-4, A-6	0-1	0-5	95-100	85-97	70-85	55-70	20-40	5-15
	55-80	Loam, sandy loam	SC-SM, SC, CL, CL-ML	A-4, A-6	0-1	0-5	90-100	85-100	75-90	45-70	25-40	5-15
77B:												
Sac-------------	0-6	Silty clay loam	CH, CL, MH, ML	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	6-16	Silty clay loam	CH, CL, MH, ML	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	16-32	Clay loam, silty clay loam	CL	A-7	0	0	100	100	95-100	90-100	40-50	15-25
	32-80	Clay loam	CL, CL-ML	A-6	0	2-5	95-100	90-100	75-90	65-80	25-40	5-20
77C:												
Sac-------------	0-6	Silty clay loam	CH, CL, MH, ML	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	6-16	Silty clay loam	CH, CL, MH, ML	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	16-32	Clay loam, silty clay loam	CL	A-6	0	0	100	100	95-100	90-100	40-50	15-25
	32-80	Clay loam	CL, CL-ML	A-6	0	2-5	95-100	90-100	75-90	65-80	25-40	5-20
77C2:												
Sac, moderately eroded---------	0-7	Silty clay loam	CH, CL, MH, ML	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	7-30	Clay loam, silty clay loam	CL	A-7	0	0	100	100	95-100	90-100	40-50	15-25
	30-80	Clay loam	CL, CL-ML	A-6	0	2-5	95-100	90-100	75-90	65-80	25-40	5-20

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
90:												
Okoboji mucky silty clay loam	0-8	Mucky silty clay loam	MH	A-7	0	0	100	100	95-100	90-95	60-90	10-30
	8-20	Silty clay loam, silty clay	CH	A-7	0	0	100	100	90-100	80-95	55-65	30-40
	20-40	Silty clay loam, silty clay	CH	A-7	0	0	100	100	90-100	80-95	55-65	30-40
	40-60	Loam, silty clay loam	CL, CH	A-7	0	0	100	100	90-100	75-90	45-55	20-30
95:												
Harps-----------	0-8	Loam	CH, CL	A-7, A-6	0	0-5	95-100	95-100	80-90	65-80	35-55	15-35
	8-16	Loam, clay loam	CH, CL	A-7, A-6	0	0-5	95-100	95-100	80-90	65-80	30-60	15-35
	16-42	Loam, clay loam	CH, CL	A-7, A-6	0	0-5	95-100	95-100	80-90	65-80	30-60	15-35
	42-60	Loam, sandy loam	SC-SM, SC, CL, CL-ML	A-4, A-6	0-1	0-5	90-100	85-100	75-90	45-70	25-40	5-15
107:												
Webster---------	0-8	Silty clay loam	CH, CL	A-7, A-6	0-1	0-5	95-100	95-100	85-95	70-90	35-60	15-30
	8-16	Silty clay loam	CH, CL	A-7, A-6	0-1	0-5	95-100	95-100	85-95	70-90	35-60	15-30
	16-32	Clay loam, loam	CL	A-7, A-6	0-1	0-5	95-100	95-100	85-95	60-80	35-50	15-30
	32-60	Loam, sandy loam	SC-SM, SC, CL, CL-ML	A-4, A-6	0-1	0-5	90-100	85-100	75-90	45-70	25-40	5-15
108:												
Wadena----------	0-7	Loam	ML	A-4	0	0	95-100	90-100	75-95	50-65	25-40	2-10
	7-11	Loam	ML	A-4	0	0	95-100	90-100	75-95	50-65	25-40	2-10
	11-26	Loam	SM, ML, CL, SC	A-4	0	0	95-100	80-100	75-95	40-60	25-40	5-12
	26-80	Stratified very gravelly coarse sand to sand	GP, GP-GM, SP, SP-SM	A-1	0-3	0-5	45-100	35-100	10-80	2-10	---	NP
108B:												
Wadena----------	0-7	Loam	ML	A-4	0	0	95-100	90-100	75-95	50-65	25-40	2-10
	7-10	Loam	ML	A-4	0	0	95-100	90-100	75-95	50-65	25-40	2-10
	10-25	Loam	SM, ML, CL, SC	A-4	0	0	95-100	80-100	75-95	40-60	25-40	5-12
	25-80	Stratified very gravelly coarse sand to sand	SP-SM, GP, GP-GM, SP	A-1	0-3	0-5	45-100	35-100	10-80	2-10	---	NP

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
133:												
Colo------------	0-8	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	90-100	40-60	15-30
	8-34	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	90-100	40-60	15-30
	34-52	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	90-100	40-55	20-30
	52-60	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	80-100	40-55	15-30
135:												
Coland----------	0-8	Clay loam	CL	A-7, A-6	0	0	100	100	95-100	65-80	35-50	15-25
	8-32	Silty clay loam, clay loam	CL	A-7, A-6	0	0	100	100	95-100	65-80	35-50	15-25
	32-40	Clay loam	CL	A-7, A-6	0	0	100	100	95-100	65-80	35-50	15-25
	40-60	Loam, sandy loam, sandy clay loam	CL-ML, CL, SC-SM, SC	A-6, A-4	0	0	100	90-100	60-70	40-60	20-40	5-15
138B:												
Clarion---------	0-7	Loam	CL-ML, CL	A-4, A-6	0-1	0-5	95-100	95-100	75-90	50-75	25-40	5-15
	7-18	Loam	CL-ML, CL	A-4, A-6	0-1	0-5	95-100	95-100	75-90	50-75	25-40	5-15
	18-36	Loam, clay loam	CL, CL-ML	A-4, A-6	0-1	0-5	90-100	85-100	75-90	50-75	25-40	5-15
	36-60	Loam, sandy loam	SC-SM, SC, CL, CL-ML	A-4, A-6	0-1	0-5	90-100	85-100	75-90	45-70	25-40	5-15
138C2:												
Clarion, moderately eroded---------	0-7	Loam	CL, CL-ML	A-6, A-4	0	0-5	95-100	95-100	75-90	50-75	25-40	5-15
	7-16	Loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	95-100	75-90	50-75	25-40	5-15
	16-35	Loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	95-100	75-90	50-75	25-40	5-15
	35-60	Loam, sandy loam	CL, CL-ML, SC, SC-SM	A-4, A-6	0-1	0-5	90-100	85-100	75-90	45-70	25-40	5-15
175:												
Dickinson-------	0-9	Fine sandy loam	SM, SC-SM, SC	A-2, A-4	0	0	100	100	85-95	30-50	15-30	NP-10
	9-18	Fine sandy loam	SM, SC-SM, SC	A-2, A-4	0	0	100	100	85-95	30-50	15-30	NP-10
	18-30	Fine sandy loam, sandy loam	SM, SC-SM, SC	A-4	0	0	100	100	85-95	35-50	15-30	NP-10
	30-36	Loamy sand, loamy fine sand, fine sand	SM, SC-SM	A-3, A-2	0	0	100	100	80-95	5-20	10-20	NP-5
	36-60	Sand	SM	A-3, A-2	0	0	100	100	70-90	5-20	0-14	NP

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
175B:												
Dickinson-------	0-9	Fine sandy loam	SM, SC, SC-SM	A-2, A-4	0	0	100	100	85-95	30-50	15-30	NP-10
	9-18	Fine sandy loam, sandy loam	SC, SM, SC-SM	A-4	0	0	100	100	85-95	35-50	15-30	NP-10
	18-30	Fine sandy loam, sandy loam	SC, SM, SC-SM	A-4	0	0	100	100	85-95	35-50	15-30	NP-10
	30-36	Loamy sand, loamy fine sand, fine sand	SM, SC-SM	A-3, A-2	0	0	100	100	80-95	5-20	10-20	NP-5
	36-60	Sand, loamy fine sand	SM	A-3, A-2	0	0	100	100	70-90	5-20	0-14	NP
191:												
Rushmore--------	0-8	Silty clay loam	CL	A-7	0	0	95-100	95-100	95-100	80-95	40-50	15-25
	8-18	Silty clay loam	CL	A-7	0	0	95-100	95-100	95-100	80-95	40-50	15-25
	18-28	Silty clay loam	CL	A-7	0	0	95-100	90-100	85-95	75-85	40-50	15-25
	28-62	Clay loam, loam	ML	A-6	---	0-5	95-100	85-100	85-95	65-75	30-50	7-25
201B:												
Coland----------	0-8	Clay loam	CL	A-7, A-6	0	0	100	100	95-100	65-80	35-50	15-25
	8-32	Silty clay loam, clay loam	CL	A-7, A-6	0	0	100	100	95-100	65-80	35-50	15-25
	32-40	Clay loam	CL	A-7, A-6	0	0	100	100	95-100	65-80	35-50	15-25
	40-60	Loam, sandy loam, sandy clay loam	CL-ML, CL, SC-SM, SC	A-6, A-4	0	0	100	90-100	60-70	40-60	20-40	5-15
Terril----------	0-9	Loam	CL	A-6	0	0-5	95-100	95-100	70-90	60-80	30-40	10-20
	9-36	Loam	CL	A-6	0	0-5	95-100	95-100	70-90	60-80	30-40	10-20
	36-50	Loam, clay loam	CL	A-7, A-6	0	0-5	95-100	90-100	70-90	60-80	30-45	10-25
	50-60	Clay loam, loam, sandy loam	SC-SM, SC, CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	65-95	35-85	20-40	5-20

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
202:												
Cylinder, 24 to 32 inches to sand and gravel	0-8	Loam	CL	A-6	0	0	100	90-100	80-100	50-75	30-40	10-20
	8-18	Loam, clay loam	CL, SC	A-6	0	0	95-100	80-100	80-95	45-70	30-40	10-20
	18-28	Clay loam	CL	A-6	0	0	95-100	80-100	80-95	45-70	30-40	10-20
	28-80	Gravelly sandy loam, gravelly sand	SP-SM, SM	A-1	0	0-10	65-95	65-95	20-55	5-25	0-14	NP
203:												
Cylinder, 32 to 40 inches to sand and gravel	0-8	Loam	CL	A-6	0	0	100	90-100	80-100	50-75	30-40	10-20
	8-18	Clay loam, loam	CL	A-6	0	0	100	90-100	80-100	50-75	30-40	10-20
	18-28	Loam, clay loam	SC, CL	A-6	0	0	95-100	80-100	80-95	45-70	30-40	10-20
	28-80	Coarse sand, very gravelly loamy sand, loamy sand	SM, SP-SM	A-1, A-3, A-2	0	0-10	65-95	65-95	20-55	5-25	0-14	NP
221:												
Klossner--------	0-10	Muck	PT	A-1	0	0	100	100	---	---	---	---
	10-26	Muck	PT	A-1	0	0	100	100	---	---	---	---
	26-48	Mucky silty clay loam, clay loam, silty clay loam, fine sandy loam	CL, CL-ML	A-4, A-6	0	0	85-100	80-100	70-95	50-90	25-40	5-20
	48-80	Clay loam, silty clay loam, fine sandy loam	CL, CL-ML	A-4, A-6	0	0	85-100	80-100	70-95	50-90	25-40	5-20
259:												
Biscay----------	0-7	Clay loam	ML, CL	A-6, A-7	0	0	95-100	95-100	70-95	50-80	35-50	10-25
	7-20	Loam, clay loam	CL, ML	A-6, A-7	0	0	95-100	95-100	70-95	50-80	35-50	10-25
	20-36	Loam, clay loam, sandy clay loam	CL, ML	A-6, A-7	0	0	95-100	90-100	70-90	50-75	30-50	10-20
	36-80	Stratified very gravelly coarse sand to loamy sand	SP, SP-SM, GP-GM, GP	A-1	0	0-5	45-95	35-95	20-45	2-10	---	NP

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
274:												
Rolfe-----------	0-10	Silt loam	OL, CL, ML	A-6, A-4	0	0	100	95-100	90-100	80-95	30-40	5-15
	10-21	Silt loam	OL, CL, ML	A-6, A-4	0	0	100	95-100	90-100	80-95	30-40	5-15
	21-55	Clay, silty clay, clay loam	CH	A-7	0	0	100	95-100	90-100	75-95	50-65	25-35
	55-80	Clay loam, loam	CL	A-6, A-7	0	0	95-100	90-100	80-90	55-75	30-45	10-20
282:												
Ransom----------	0-8	Silty clay loam	ML	A-7	0	0	100	100	95-100	80-95	40-50	10-20
	8-16	Silty clay loam	ML	A-7	0	0	100	100	95-100	80-95	40-50	10-20
	16-33	Silty clay loam	ML	A-7	0	0	95-100	90-100	85-100	75-95	35-50	10-20
	33-80	Clay loam, loam	ML, CL	A-4	---	0-5	95-100	85-100	75-95	55-80	30-40	5-15
308:												
Wadena, 32 to 40 inches to sand and gravel-----	0-8	Loam	ML	A-4	0	0	95-100	90-100	75-95	50-65	25-40	2-10
	8-13	Loam	ML	A-4	0	0	95-100	90-100	75-95	50-65	25-40	2-10
	13-34	Loam, sandy loam, sandy clay loam	SC, SM, CL, ML	A-6, A-4	0	0	95-100	80-100	75-95	40-60	25-40	5-12
	34-60	Stratified very gravelly coarse sand to sand	GP-GM, SP, GP, SP-SM	A-2, A-1, A-3	0-3	0-5	45-100	35-100	10-80	2-10	0-14	NP
308B:												
Wadena, 32 to 40 inches to sand and gravel-----	0-8	Loam	ML	A-4	0	0	95-100	90-100	75-95	50-65	25-40	2-10
	8-13	Loam	SM, SC, CL, ML	A-4, A-6	0	0	95-100	80-100	75-95	40-60	25-40	5-12
	13-34	Loam, sandy loam, sandy clay loam	SM, SC, CL, ML	A-4, A-6	0	0	95-100	80-100	75-95	40-60	25-40	5-12
	34-60	Stratified very gravelly coarse sand to sand	GP-GM, SP-SM, SP, GP	A-1, A-3, A-2	0-3	0-5	45-100	35-100	10-80	2-10	0-14	NP
354.												
Aquolls (marsh), ponded												

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
375: Fostoria, lacustrine substratum-----	0-7	Clay loam	CL	A-4	0	0	100	100	95-100	80-95	25-40	5-15
	7-19	Loam	CL	A-6	0	0-5	100	100	75-100	55-95	30-40	10-20
	19-46	Loam	CL	A-6	0	0-5	100	100	75-100	55-95	30-40	10-20
	46-52	Silty clay, silty clay loam	CH, CL, MH, ML	A-7	0	0	100	95-100	95-100	80-95	40-65	15-30
	52-80	Silty clay loam, silty clay, clay	CH, CL, MH, ML	A-7	0	0	100	95-100	95-100	80-95	40-65	15-30
376F: Cornell---------	0-6	Clay loam, silty clay loam	ML	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	6-21	Clay loam, silty clay loam	ML	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	21-43	Clay loam, silty clay, clay	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	43-80	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	35-45	15-25
379: Ocheyedan, lacustrine substratum-----	0-7	Clay loam	CL	A-6	0	0	100	100	75-90	65-80	30-40	10-15
	7-14	Loam	CL	A-6	0	0	100	100	75-90	65-80	30-40	10-15
	14-40	Fine sandy loam, sandy clay loam, loam	SC	A-4	0	0	100	100	60-80	35-55	25-40	5-15
	40-60	Silt loam	CL	A-4	0	0	100	100	85-95	50-90	25-40	5-15
	60-80	Silty clay	ML	A-7	0	0	100	95-100	95-100	80-95	40-65	15-30

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
379B:												
Ocheyedan, lacustrine substratum-----	0-7	Clay loam	CL	A-6	0	0	100	100	75-90	65-80	30-40	10-15
	7-14	Loam	CL	A-6	0	0	100	100	75-90	65-80	30-40	10-15
	14-40	Fine sandy loam, sandy clay loam, loam	SC	A-4	0	0	100	100	60-80	35-55	25-40	5-15
	40-60	Silt loam	CL	A-4	0	0	100	100	85-95	50-90	25-40	5-15
	60-80	Silty clay	ML	A-7	0	0	100	95-100	95-100	80-95	40-65	15-30
379C2:												
Ocheyedan, lacustrine substratum, moderately eroded---------	0-8	Clay loam	CL	A-6	0	0	100	100	75-90	65-80	30-40	10-15
	8-40	Fine sandy loam, sandy clay loam, loam	SC	A-4	0	0	100	100	60-80	35-55	25-40	5-15
	40-60	Silt loam	CL	A-4	0	0	100	100	85-95	50-90	25-40	5-15
	60-80	Silty clay	ML	A-7	0	0	100	95-100	95-100	80-95	40-65	15-30
384:												
Collinwood------	0-7	Clay, silty clay	CL, ML, CH, MH	A-7	0	0	100	100	95-100	90-95	40-55	15-25
	7-15	Silty clay loam, silty clay	CL, CH, ML, MH	A-7	0	0	100	100	95-100	90-95	40-55	15-25
	15-33	Clay loam, silty clay, sandy clay loam	MH, CH	A-7	0	0	100	100	95-100	90-95	50-65	20-35
	33-60	Silty clay, clay, silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-95	40-60	15-30

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
390:												
Waldorf---------	0-9	Silty clay, silty clay loam	ML, MH	A-7	0	0	100	100	95-100	90-100	45-65	14-30
	9-28	Silty clay loam, silty clay	MH	A-7	0	0	100	100	95-100	90-100	45-65	14-30
	28-45	Clay, silty clay	MH	A-7	0	0	100	100	95-100	95-100	50-70	20-35
	45-80	Silty clay	MH, CL, ML, CH	A-7	0	0	100	100	95-100	90-100	35-65	11-30
397:												
Letri-----------	0-8	Clay loam	CL	A-7	0	0	95-100	95-100	95-100	80-95	40-50	15-25
	8-18	Clay loam	CL	A-7	0	0	95-100	95-100	95-100	80-95	40-50	15-25
	18-32	Gravelly sandy loam	CL	A-7	0	0	95-100	90-100	85-95	75-85	40-50	15-25
	32-60	Silty clay loam, clay loam	CL, ML	A-6	---	0-5	95-100	85-100	85-95	65-75	30-50	7-25
433E:												
Moneta----------	0-9	Clay loam, loam	CL	A-6	0	0-5	95-100	95-98	80-95	65-80	36-39	15-18
	9-60	Loam, clay loam	CL	A-6	0	0-5	95-100	90-98	70-95	55-70	28-39	9-18
	60-80	Clay loam, loam	CL	A-6	0	0-5	95-100	90-98	70-95	55-70	28-39	9-18
433F:												
Moneta----------	0-9	Clay loam, loam	CL	A-6	0	0-5	95-100	95-98	80-95	65-80	36-39	15-18
	9-60	Loam, clay loam	CL	A-6	0	0-5	95-100	90-98	70-95	55-70	28-39	9-18
	60-80	Clay loam, loam	CL	A-6	0	0-5	95-100	90-98	70-95	55-70	28-39	9-18
433G:												
Moneta----------	0-9	Clay loam, loam	CL	A-6	0	0-5	95-100	95-98	80-95	65-80	36-39	15-18
	9-60	Loam, clay loam	CL	A-6	0	0-5	95-100	90-98	70-95	55-70	28-39	9-18
	60-80	Clay loam, loam	CL	A-6	0	0-5	95-100	90-98	70-95	55-70	28-39	9-18
455:												
Wilmonton-------	0-8	Clay loam	CL	A-6	0	0	100	90-100	85-100	60-90	30-50	12-25
	8-17	Clay loam	CL	A-6	0	0	100	90-100	85-100	60-90	30-50	12-25
	17-25	Loam, clay loam	CL	A-6	---	0-5	95-100	85-100	80-90	60-80	30-50	15-25
	25-55	Clay loam, loam	CL	A-6	---	0-5	95-100	85-100	75-85	55-75	25-40	10-25
	55-80	Clay loam	CL	A-6	---	0-5	95-100	85-100	75-85	55-75	25-40	10-25

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
456:												
Wilmonton-------	0-8	Silty clay loam	CL	A-6	0	0	100	90-100	85-100	60-90	30-50	12-25
	8-14	Silty clay loam	CL	A-6	0	0	100	90-100	85-100	60-90	30-50	12-25
	14-35	Clay loam	CL	A-6	---	0-5	95-100	85-100	80-90	60-80	30-50	15-25
	35-80	Clay loam	CL	A-6	---	0-5	95-100	85-100	75-85	55-75	25-40	10-25
485:												
Spillville------	0-20	Loam	CL	A-6	0	0	100	95-100	85-95	60-80	25-40	10-20
	20-54	Loam	CL	A-6	0	0	100	95-100	85-95	60-80	25-40	10-20
	54-80	Sandy clay loam, loam, sandy loam	SC-SM, SC, CL, CL-ML	A-4, A-6	0	0	100	95-100	80-90	35-75	20-40	5-15
506:												
Wacousta--------	0-9	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	95-100	40-65	20-40
	9-14	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	95-100	40-65	20-40
	14-16	Silty clay loam, silt loam	CH, CL	A-7	0	0	100	100	90-100	90-100	40-60	20-35
	16-60	Silt loam, silty clay loam	ML, CL	A-4, A-6	0	0-5	95-100	95-100	85-100	80-90	30-40	5-15
507:												
Canisteo--------	0-10	Clay loam	ML, OL	A-7	0	0	95-100	95-100	85-100	60-100	40-50	15-20
	10-18	Clay loam	ML, OL	A-7	0	0	95-100	95-100	85-100	60-100	40-50	15-20
	18-39	Clay loam, loam, silty clay loam	CL	A-7, A-6	0	0	98-100	90-100	85-95	65-85	38-50	25-35
	39-80	Loam, sandy loam	SC-SM, SC, CL, CL-ML	A-4, A-6	0-1	0-5	90-100	85-100	75-90	45-70	25-40	5-15
541C:												
Estherville-----	0-7	Sandy loam	SM, SC, SC-SM	A-2, A-4	0	0-5	90-100	80-100	50-75	25-50	20-30	2-10
	7-18	Sandy loam, loam, coarse sandy loam	SM, SC-SM, SC	A-1, A-4, A-2	0	0-5	85-100	80-95	40-75	15-45	20-30	2-8
	18-80	Gravelly coarse sand, very gravelly sand, loamy coarse sand	SP, SM, GP, SP-SM	A-1	0	0-10	55-90	50-85	10-40	2-25	---	NP

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
541C:												
Hawick----------	0-7	Gravelly loamy sand	SM	A-2	0-2	0-5	85-100	80-95	50-65	25-35	0-20	NP-4
	7-11	Gravelly loamy sand, gravelly coarse sand, loamy sand	SP-SM, SM	A-1, A-2, A-3	0-2	0-5	75-95	60-95	35-70	5-25	0-14	NP
	11-73	Gravelly coarse sand, gravelly sand, coarse sand, sand	SP, SP-SM	A-1, A-3, A-2	0-2	0-5	60-95	50-95	30-65	2-10	0-14	NP
559:												
Talcot----------	0-10	Clay loam	CL	A-7	0	0	100	100	80-90	60-85	40-50	15-25
	10-26	Silty clay loam, clay loam	CL	A-7	0	0	100	100	80-90	60-85	40-50	15-25
	26-30	Silty clay loam, clay loam	CL	A-7	0	0	95-100	85-100	70-90	60-85	40-50	15-25
	30-60	Loamy coarse sand, gravelly sand	SP-SM	A-1	0	0	65-90	50-85	20-50	2-10	0-14	NP
577B:												
Everly----------	0-8	Clay loam	CL	A-6	0	0	100	95-100	85-95	65-80	30-45	10-20
	8-12	Clay loam	CL	A-6	0	0	100	95-100	85-95	65-80	30-45	10-20
	12-26	Loam, clay loam	CL	A-7	0	0	95-100	95-100	85-95	70-90	35-50	15-25
	26-80	Loam, clay loam	CL	A-6	0	0-5	90-100	85-95	75-85	60-80	30-40	10-20
577C2:												
Everly, moderately eroded---------	0-7	Clay loam	CL	A-6	0	0	100	95-100	85-95	65-80	30-45	10-20
	7-26	Clay loam	CL	A-7	0	0	95-100	95-100	85-95	70-90	35-50	15-25
	26-80	Loam, clay loam	CL	A-6	0	0-5	90-100	85-95	75-85	60-80	30-40	10-20
637D2:												
Everly, moderately eroded---------	0-7	Clay loam	CL	A-6	0	0	100	95-100	85-95	65-80	30-45	10-20
	7-26	Loam, clay loam	CL	A-7	0	0	95-100	95-100	85-95	70-90	35-50	15-25
	26-80	Loam, clay loam	CL	A-6	0	0-5	90-100	85-95	75-85	60-80	30-40	10-20

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
637D2:												
Moneta, moderately eroded---------	0-7	Clay loam, loam	CL	A-6	0	0-5	95-100	95-98	80-95	65-80	36-39	15-18
	7-57	Loam, clay loam	CL	A-6	0	0-5	95-100	90-98	70-95	55-70	28-39	9-18
	57-80	Clay loam, loam	CL	A-6	0	0-5	95-100	90-98	70-95	55-70	28-39	9-18
638C2:												
Clarion, moderately eroded---------	0-7	Loam	CL, CL-ML	A-4, A-6	0	0-5	95-100	95-100	75-90	50-75	25-40	5-15
	7-16	Loam, silt loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	95-100	75-90	50-75	25-40	5-15
	16-35	Loam, silt loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	95-100	75-90	50-75	25-40	5-15
	35-60	Loam, sandy loam	SC-SM, SC, CL, CL-ML	A-6, A-4	0	0-5	90-100	85-100	75-90	45-70	25-40	5-15
Storden, moderately eroded---------	0-7	Loam	CL, ML	A-4, A-6	0	0-5	95-100	95-100	70-85	55-70	30-40	5-15
	7-11	Loam, clay loam	CL, CL-ML	A-4, A-6	0-1	0-5	95-100	85-97	70-85	55-70	20-40	5-15
	11-80	Loam, sandy loam	SC-SM, SC, CL, CL-ML	A-4, A-6	0-1	0-5	90-100	85-100	75-90	45-70	25-40	5-15
672:												
May City--------	0-7	Sandy clay loam, loam	SM	A-4, A-2	0	0	95-100	90-100	55-70	25-40	15-26	2-7
	7-19	Sandy clay loam, loam	SM, SC, CL, ML	A-4, A-2	0	0	95-100	85-100	50-95	25-75	15-30	2-10
	19-80	Extremely gravelly sandy loam, very gravelly sandy loam	SP	A-1	0	0	50-85	45-85	20-35	1-5	0-14	NP
672B:												
May City--------	0-7	Sandy clay loam, loam	SM	A-4, A-2	0	0	95-100	90-100	55-70	25-40	15-26	2-7
	7-19	Sandy clay loam, loam	SM, SC, CL, ML	A-4, A-2	0	0	95-100	85-100	50-95	25-75	15-30	2-10
	19-80	Extremely gravelly sandy loam, very gravelly sandy loam	SP	A-1	0	0	50-85	45-85	20-35	1-5	0-14	NP

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
672C2:												
May City, moderately eroded---------	0-7	Sandy clay loam, loam	SM	A-4, A-2	0	0	95-100	90-100	55-70	25-40	15-26	2-7
	7-17	Sandy clay loam, loam	SM, SC, CL, ML	A-4, A-2	0	0	95-100	85-100	50-95	25-75	15-30	2-10
	17-80	Extremely gravelly sandy loam, very gravelly sandy loam	SP	A-1	0	0	50-85	45-85	20-35	1-5	0-14	NP
709:												
Fairhaven-------	0-9	Silt loam	ML	A-4	0	0	95-100	95-100	80-95	60-85	25-40	NP-15
	9-25	Silt loam	ML	A-4	0	0	95-100	95-100	80-95	60-85	25-40	NP-15
	25-30	Sandy loam, clay loam, loam	ML	A-4	0	0	95-100	95-100	80-95	60-85	25-40	2-15
	30-80	Gravelly loamy sand	SP-SM	A-1	0	0-5	50-100	35-100	20-50	1-10	---	NP
733:												
Calco-----------	0-9	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-100	40-60	15-30
	9-27	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-100	40-60	15-30
	27-36	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-100	40-60	15-30
	36-80	Silt loam, silty clay loam	CL	A-6	0	0	100	100	90-100	80-100	30-45	10-20
735:												
Havelock--------	0-9	Clay loam	CL	A-7	0	0	100	100	95-100	65-85	45-55	20-30
	9-40	Clay loam	CL	A-7	0	0	100	100	95-100	65-85	45-55	20-30
	40-73	Sandy loam, loam	CL	A-4	0	0	100	90-100	60-70	40-60	20-40	5-15

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
740D:												
Hawick----------	0-7	Gravelly loamy sand	SM	A-2	0-2	0-5	85-100	80-95	50-65	25-35	0-20	NP-4
	7-11	Gravelly loamy sand, gravelly coarse sand, loamy sand	SP-SM	A-1, A-2, A-3	0-2	0-5	75-95	60-95	35-70	5-25	0-14	NP
	11-73	Gravelly coarse sand, gravelly sand, coarse sand, sand	SP, SP-SM	A-1, A-3, A-2	0-2	0-5	60-95	50-95	30-65	2-10	0-14	NP
810:												
Galva, terrace--	0-6	Silty clay loam	ML	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	6-17	Silty clay loam	ML	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	17-31	Silty clay loam	CL	A-7	0	0	100	100	95-100	90-100	40-50	15-25
	31-45	Silt loam, silty clay loam	CL	A-7	0	0	100	100	95-100	85-100	35-50	15-25
	45-60	Silt loam	CL	A-6	0	2-5	95-100	90-100	75-90	65-80	30-40	10-20
810B:												
Galva, terrace--	0-6	Silty clay loam	ML	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	6-17	Silty clay loam	ML	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	17-31	Silty clay loam	CL	A-7	0	0	100	100	95-100	90-100	40-50	15-25
	31-45	Silty clay loam, silt loam	CL	A-7	0	0	100	100	95-100	85-100	35-50	15-25
	45-60	Silt loam	CL	A-6	0	2-5	95-100	90-100	75-90	65-80	30-40	10-20
828B:												
Zenor-----------	0-8	Sandy loam	SC-SM, SC	A-4, A-2	0	0-5	85-95	80-95	60-70	25-40	15-25	5-10
	8-33	Sandy loam, loam	SC-SM, SC	A-4, A-2	0	0-5	85-95	80-95	50-70	25-40	15-25	5-10
	33-60	Sand, gravelly loamy sand, gravelly sand, loamy sand	SW, SP-SM, SP	A-1	0	0-5	85-95	80-90	20-40	3-12	15-20	NP-5

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
828C2:												
Zenor, moderately eroded---------	0-8	Sandy loam	SC-SM, SC	A-2, A-4	0	0-5	85-95	80-95	60-70	25-40	15-25	5-10
	8-30	Sandy loam, loam	SC-SM, SC	A-2, A-4	0	0-5	85-95	80-95	50-70	25-40	15-25	5-10
	30-60	Sand, gravelly loamy sand, gravelly sand, loamy sand	SW, SP, SP-SM	A-1	0	0-5	85-95	80-90	20-40	3-12	15-20	NP-5
835D2:												
Storden, moderately eroded---------	0-7	Loam	CL, ML	A-4, A-6	0	0-5	95-100	95-100	70-85	55-70	30-40	5-15
	7-11	Loam, clay loam	CL, CL-ML	A-4, A-6	0-1	0-5	95-100	85-97	70-85	55-70	20-40	5-15
	11-80	Loam, sandy loam	SC-SM, SC, CL, CL-ML	A-4, A-6	0-1	0-5	90-100	85-100	75-90	45-70	25-40	5-15
Omsrud, moderately eroded---------	0-7	Loam	CL, CL-ML	A-6, A-4	0	0-5	95-100	95-100	75-90	50-75	25-40	5-15
	7-24	Loam, silt loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	95-100	75-90	50-75	25-40	5-15
	24-60	Loam, sandy loam	SC-SM, SC, CL, CL-ML	A-6, A-4	0	0-5	90-100	85-100	75-90	45-70	25-40	5-15
835E2:												
Storden, moderately eroded---------	0-7	Loam	CL	A-6	0	0-5	95-100	95-98	70-85	55-70	28-36	9-15
	7-11	Loam, sandy loam	CL	A-6	0	0-5	95-100	90-98	70-85	55-70	25-35	8-15
	11-80	Loam, sandy loam	SC-SM, SC, CL, CL-ML	A-4, A-6	0-1	0-5	90-100	85-100	75-90	45-70	25-40	5-15
Omsrud, moderately eroded---------	0-7	Loam	CL, CL-ML	A-6, A-4	0	0-5	95-100	95-100	75-90	50-75	25-40	5-15
	7-24	Loam, silt loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	95-100	75-90	50-75	25-40	5-15
	24-60	Loam, sandy loam	SC-SM, SC, CL, CL-ML	A-6, A-4	0	0-5	90-100	85-100	75-90	45-70	25-40	5-15
854D.												
Histosols, fens												

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
874: Dickinson, lacustrine substratum-----	0-9	Sandy loam	SM, SC-SM, SC	A-2, A-4	0	0	100	100	85-95	30-50	15-30	NP-10
	9-30	Fine sandy loam	SM, SC-SM, SC	A-2, A-4	0	0	100	100	85-95	30-50	15-30	NP-10
	30-36	Loamy sand, loamy fine sand, fine sand	SC-SM	A-3, A-2	0	0	100	100	80-95	5-20	10-20	NP-5
	36-67	Sand	SM	A-3, A-2	0	0	100	100	70-90	5-20	0-14	NP
	67-80	Silty clay loam, silt loam	CL	A-7	0	0	100	100	95-100	85-100	35-50	15-25
874B: Dickinson, lacustrine substratum-----	0-9	Sandy loam	SM, SC-SM, SC	A-2, A-4	0	0	100	100	85-95	30-50	15-30	NP-10
	9-30	Fine sandy loam	SM, SC-SM, SC	A-2, A-4	0	0	100	100	85-95	30-50	15-30	NP-10
	30-36	Loamy sand, loamy fine sand, fine sand	SC-SM	A-3, A-2	0	0	100	100	80-95	5-20	10-20	NP-5
	36-67	Sand	SM	A-3, A-2	0	0	100	100	70-90	5-20	0-14	NP
	67-80	Silty clay loam, silt loam	CL	A-7	0	0	100	100	95-100	85-100	35-50	15-25
874C2: Dickinson, lacustrine substratum, moderately eroded---------	0-8	Sandy loam	SM, SC-SM, SC	A-2, A-4	0	0	100	100	85-95	30-50	15-30	NP-10
	8-30	Fine sandy loam, sandy loam	SM, SC-SM, SC	A-4	0	0	100	100	85-95	35-50	15-30	NP-10
	30-36	Loamy sand, loamy fine sand, fine sand	SC-SM	A-3, A-2	0	0	100	100	80-95	5-20	10-20	NP-5
	36-67	Sand	SM	A-3, A-2	0	0	100	100	70-90	5-20	0-14	NP
	67-80	Silt loam, silty clay loam	CL	A-7	0	0	100	100	95-100	85-100	35-50	15-25

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	Percentage passing sieve number--: 10	Percentage passing sieve number--: 40	Percentage passing sieve number--: 200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
875:												
Roine-----------	0-8	Fine sandy loam, sandy loam, loam	SC	A-4	0	0	100	100	80-95	30-50	15-30	NP-10
	8-48	Fine sandy loam	SC	A-4	0	0	100	100	80-95	30-50	15-30	NP-10
	48-52	Loam	CL	A-6	0	2-5	90-95	85-95	80-90	55-65	25-35	11-20
	52-59	Silt loam	CL	A-7	0	0	100	100	95-100	85-100	35-50	15-25
	59-80	Clay loam	CL	A-6	0	2-5	90-95	85-95	80-90	55-65	25-35	11-20
875B:												
Roine-----------	0-8	Fine sandy loam, sandy loam, loam	SC	A-4	0	0	100	100	80-95	30-50	15-30	NP-10
	8-48	Fine sandy loam	SC	A-4	0	0	100	100	80-95	30-50	15-30	NP-10
	48-52	Loam	CL	A-6	0	2-5	90-95	85-95	80-90	55-65	25-35	11-20
	52-59	Silt loam	CL	A-7	0	0	100	100	95-100	85-100	35-50	15-25
	59-80	Clay loam	CL	A-6	0	2-5	90-95	85-95	80-90	55-65	25-35	11-20
875C2:												
Roine, moderately eroded---------	0-8	Fine sandy loam, sandy loam, loam	SC	A-4	0	0	100	100	80-95	30-50	15-30	NP-10
	8-45	Fine sandy loam	SC	A-4	0	0	100	100	80-95	30-50	15-30	NP-10
	45-52	Loam	CL	A-6	0	2-5	90-95	85-95	80-90	55-65	25-35	11-20
	52-59	Silt loam	CL	A-7	0	0	100	100	95-100	85-100	35-50	15-25
	59-80	Clay loam	CL	A-6	0	2-5	90-95	85-95	80-90	55-65	25-35	11-20
878:												
Ocheyedan-------	0-7	Loam	CL	A-6	0	0	100	100	75-90	65-80	30-40	10-15
	7-14	Loam	CL	A-6	0	0	100	100	75-90	65-80	30-40	10-15
	14-34	Fine sandy loam, sandy clay loam, loam	SC	A-4	0	0	100	100	60-80	35-55	25-40	5-15
	34-60	Clay loam, silt loam	CL	A-4	0	0	100	100	85-95	50-90	25-40	5-15

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
878B:												
Ocheyedan-------	0-7	Loam	CL	A-6	0	0	100	100	75-90	65-80	30-40	10-15
	7-14	Loam	CL	A-6	0	0	100	100	75-90	65-80	30-40	10-15
	14-34	Loam, sandy clay loam, fine sandy loam	SC	A-4	0	0	100	100	60-80	35-55	25-40	5-15
	34-60	Clay loam, silt loam	CL	A-4	0	0	100	100	85-95	50-90	25-40	5-15
879:												
Fostoria--------	0-7	Loam	CL	A-4	0	0	100	100	95-100	80-95	25-40	5-15
	7-19	Loam	CL	A-6	0	0-5	100	100	75-100	55-95	30-40	10-20
	19-34	Loam	CL	A-6	0	0-5	100	100	75-100	55-95	30-40	10-20
	34-80	Loam, silt loam	CL	A-6	0	0-5	100	100	75-100	55-95	30-40	10-20
928:												
Annieville------	0-8	Silty clay loam	ML	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	8-20	Silty clay loam	ML	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	20-52	Silty clay loam	CL	A-7	0	0	100	100	95-100	90-100	40-50	15-25
	52-57	Clay loam, sandy loam	CL, ML	A-6, A-7	0	0	95-100	90-100	70-90	50-75	30-50	10-20
	57-80	Clay loam, loam	CL	A-6	0	2-5	95-100	90-100	75-90	65-80	30-40	10-20
928B:												
Annieville------	0-8	Silty clay loam	ML	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	8-20	Silty clay loam	ML	A-7	0	0	100	100	95-100	90-100	40-55	15-25
	20-52	Silty clay loam	CL	A-7	0	0	100	100	95-100	90-100	40-50	15-25
	52-57	Clay loam, sandy loam	CL, ML	A-6, A-7	0	0	95-100	90-100	70-90	50-75	30-50	10-20
	57-80	Loam, clay loam	CL	A-6	0	2-5	95-100	90-100	75-90	65-80	30-40	10-20
992:												
Gillett Grove---	0-8	Silty clay loam, silty clay	CH, MH	A-7	0	0	100	100	95-100	90-100	50-65	20-35
	8-17	Silty clay loam, silty clay	CH, MH	A-7	0	0	100	100	95-100	90-100	50-65	20-35
	17-44	Silty clay loam	CL	A-7	0	0	100	100	95-100	90-100	35-50	20-35
	44-57	Silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	85-95	30-40	15-25
	57-62	Loam, clay loam	CL	A-6	0	0-5	90-100	85-100	80-90	50-75	30-40	10-20

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
1053:												
Belmann, gypsum phase----------	0-7	Clay loam, loam	CL	A-7	0	0	100	95-100	95-100	80-95	40-50	15-25
	7-57	Clay loam	CL	A-7	0	0	100	95-100	95-100	80-95	40-50	15-25
	57-80	Silty clay, silty clay loam	ML	A-7	0	0	100	95-100	95-100	80-95	40-65	15-30
1091:												
McCreath--------	0-6	Silty clay loam	CH, MH	A-7	0	0	100	100	95-100	90-100	50-60	20-30
	6-17	Silty clay loam	CH, MH	A-7	0	0	100	100	95-100	90-100	50-60	20-30
	17-35	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	40-55	20-30
	35-44	Silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	90-100	30-40	11-20
	44-80	Clay loam, gravelly loam, loam	CL, CL-ML	A-6, A-4	0	0-5	80-100	75-95	70-95	55-75	25-40	5-15
1092:												
Gillett Grove---	0-8	Silty clay loam, silty clay	CH, MH	A-7	0	0	100	100	95-100	90-100	50-65	20-35
	8-17	Silty clay loam, silty clay	CH, MH	A-7	0	0	100	100	95-100	90-100	50-65	20-35
	17-44	Silty clay loam	CL	A-7	0	0	100	100	95-100	90-100	35-50	20-35
	44-57	Silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	85-95	30-40	15-25
	57-62	Loam, clay loam	CL	A-6	0	0-5	90-100	85-100	80-90	50-75	30-40	10-20
1133:												
Colo------------	0-8	Silty clay loam	CL	A-7	0	0	100	100	90-100	90-100	40-60	15-30
	8-34	Silty clay loam	CL	A-7	0	0	100	100	90-100	90-100	40-60	15-30
	34-52	Silty clay loam	CL	A-7	0	0	100	100	90-100	90-100	40-55	20-30
	52-60	Silty clay loam	CL	A-7	0	0	100	100	95-100	80-100	40-55	15-30

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
1259:												
Biscay, depressional---	0-7	Clay loam	CL, ML	A-6, A-7	0	0	95-100	95-100	70-90	50-75	35-50	10-25
	7-21	Loam, clay loam	CL, ML	A-6, A-7	0	0	95-100	95-100	70-90	50-75	35-50	10-25
	21-37	Loam, clay loam, sandy clay loam	CL, ML	A-6, A-7	0	0	95-100	90-100	70-90	50-75	30-50	10-20
	37-42	Gravelly loam, sandy loam, gravelly sandy loam	SM, SC-SM, SC	A-4	---	0-5	95-100	70-95	50-80	35-50	15-30	2-10
	42-60	Stratified very gravelly coarse sand to loamy sand	SP, SP-SM, GP-GM, GP	A-1	---	0-5	45-95	35-95	20-45	2-10	---	NP
1385:												
Ocheda----------	0-8	Silty clay loam	CH, ML, CL, MH	A-7	0	0	100	100	95-100	90-95	40-55	15-25
	8-20	Silty clay loam	CH, ML, CL, MH	A-7	0	0	100	100	95-100	90-95	40-55	15-25
	20-24	Silty clay, clay, silty clay loam	CH, MH	A-7	0	0	100	100	95-100	90-95	50-65	20-35
	24-57	Silty clay, clay, silty clay loam	CH, CL	A-7	0	0	100	100	95-100	90-95	40-60	15-30
	57-80	Clay loam, loam	CL	A-6, A-7	---	0-5	90-100	90-98	85-95	60-75	30-50	10-25
1508:												
Belmann---------	0-8	Clay loam, loam	CL	A-7	0	0	100	95-100	95-100	80-95	40-50	15-25
	8-16	Clay loam, loam	CL	A-7	0	0	100	95-100	95-100	80-95	40-50	15-25
	16-24	Clay loam, silty clay loam	CL	A-7	0	0	100	95-100	95-100	80-95	40-50	15-25
	24-52	Silty clay, clay	ML	A-7	0	0	100	95-100	95-100	80-95	40-65	15-30
	52-80	Silty clay	ML	A-7	0	0	100	95-100	95-100	80-95	40-65	15-30
1585:												
Spillville------	0-47	Loam	CL	A-6	0	0	100	95-100	85-95	60-80	25-40	10-20
	47-80	Sandy clay loam, loam, sandy loam	SC-SM, SC, CL, CL-ML	A-4, A-6	0	0	100	95-100	80-90	35-75	20-40	5-15

Table 17.--Engineering Index Properties--Continued

Map symbol and component name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
1585:												
Coland----------	0-39	Clay loam	CL	A-7, A-6	0	0	100	100	95-100	65-80	35-50	15-25
	39-60	Loam, sandy loam, sandy clay loam	CL-ML, CL, SC-SM, SC	A-6, A-4	0	0	100	90-100	60-70	40-60	20-40	5-15
5010. Pits, sand and gravel												
5040. Udorthents, loamy												
5060. Pits, clay												
AW. Animal waste												
SL. Sewage lagoon												
W. Water												

Table 18.--Physical Properties of the Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer. Absence of an entry indicates that data were not estimated)

Map symbol and component name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors Kw	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
6:												
Okoboji	0-6	35-40	1.30-1.40	0.2-0.6	0.21-0.23	6.0-8.9	9.0-12	.32	.32	5	4	86
	6-32	35-40	1.30-1.40	0.2-0.6	0.21-0.23	6.0-8.9	3.0-9.0	.32	.32			
	32-56	35-42	1.30-1.40	0.2-0.6	0.18-0.20	6.0-8.9	0.5-3.0	.32	.32			
	56-60	25-35	1.40-1.50	0.6-2	0.18-0.20	2.6-5.8	0.0-0.5	.28	.28			
27B:												
Terril	0-9	18-26	1.35-1.40	0.6-2	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	5	6	48
	9-36	18-32	1.35-1.40	0.6-2	0.20-0.22	0.0-2.9	1.0-3.0	.24	.24			
	36-50	24-30	1.40-1.45	0.6-2	0.17-0.19	2.3-4.2	0.5-1.0	.28	.28			
	50-60	15-30	1.45-1.70	0.6-2	0.16-0.18	0.0-4.2	0.0-0.5	.32	.32			
27C:												
Terril	0-9	18-26	1.35-1.40	0.6-2	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	5	6	48
	9-36	18-30	1.35-1.40	0.6-2	0.20-0.22	0.0-2.9	1.0-3.0	.24	.24			
	36-50	24-30	1.40-1.45	0.6-2	0.17-0.19	0.0-2.9	0.5-1.0	.28	.28			
	50-60	15-30	1.45-1.70	0.6-2	0.16-0.18	0.0-2.9	0.0-0.5	.32	.32			
27D:												
Terril	0-9	18-26	1.35-1.40	0.6-2	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	5	6	48
	9-36	18-30	1.35-1.40	0.6-2	0.20-0.22	0.0-2.9	1.0-3.0	.24	.24			
	36-50	24-30	1.40-1.45	0.6-2	0.17-0.19	0.0-2.9	0.5-1.0	.28	.28			
	50-60	15-30	1.45-1.70	0.6-2	0.16-0.18	0.0-2.9	0.0-0.5	.32	.32			
31:												
Afton	0-7	33-38	1.25-1.30	0.2-0.6	0.21-0.23	6.0-8.9	6.0-7.0	.32	.32	5	4	86
	7-32	33-38	1.25-1.30	0.2-0.6	0.21-0.23	6.0-8.9	3.0-6.0	.32	.32			
	32-43	25-35	1.25-1.30	0.2-0.6	0.18-0.20	6.0-8.9	0.5-3.0	.43	.43			
	51-65	25-30	1.30-1.45	0.2-2	0.14-0.16	3.0-5.9	0.0-0.5	.43	.43			
	65-80	22-32	1.55-1.65	0.6-2	0.17-0.19	3.0-5.9	0.0-0.5	.32	.32			
34B:												
Estherville	0-7	5-15	1.25-1.35	2-6	0.13-0.18	0.0-2.9	1.5-2.5	.20	.20	3	3	86
	7-18	10-18	1.35-1.60	2-6	0.12-0.19	0.0-2.9	0.5-1.0	.20	.20			
	18-80	0-8	1.50-1.65	6-20	0.02-0.04	0.0-2.9	0.0-0.5	.10	.10			
41C:												
Sparta	0-11	3-10	1.20-1.40	2-6	0.09-0.12	0.0-2.9	1.0-2.0	.17	.17	5	2	134
	11-15	1-8	1.40-1.60	6-20	0.05-0.11	0.0-2.9	0.1-1.0	.15	.15			
	15-60	0-5	1.50-1.70	6-20	0.04-0.07	0.0-2.9	0.0-0.5	.15	.15			
48:												
Knoke	0-8	27-36	1.30-1.40	0.2-0.6	0.21-0.25	6.0-8.9	8.0-15	.32	.32	5	4L	86
	8-15	27-36	1.30-1.40	0.2-0.6	0.21-0.23	6.0-8.9	5.0-8.0	.32	.32			
	15-39	27-36	1.30-1.40	0.2-0.6	0.21-0.23	6.0-8.9	3.0-5.0	.37	.37			
	39-80	27-45	1.35-1.45	0.2-0.6	0.18-0.20	6.0-8.9	0.0-3.0	.37	.37			
54:												
Zook	0-6	35-40	1.30-1.35	0.2-0.6	0.21-0.23	6.0-8.9	5.0-7.0	.37	.37	5	7	38
	6-20	35-40	1.30-1.35	0.2-0.6	0.21-0.23	6.0-8.9	4.0-5.0	.37	.37			
	20-60	36-45	1.30-1.45	0.06-0.2	0.11-0.13	6.0-8.9	1.0-4.0	.28	.28			
55:												
Nicollet	0-10	21-27	1.15-1.25	0.6-2	0.17-0.22	1.3-3.2	5.0-6.0	.24	.24	5	6	48
	10-17	22-28	1.15-1.25	0.6-2	0.17-0.22	1.3-3.2	3.0-5.0	.24	.24			
	17-36	17-30	1.25-1.35	0.6-2	0.15-0.19	0.1-4.2	0.5-2.0	.37	.37			
	36-60	12-22	1.50-1.70	0.6-2	0.17-0.19	0.0-1.6	0.0-0.5	.37	.37			

Table 18.--Physical Properties of the Soils--Continued

Map symbol and component name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors Kw	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
62F:												
Storden----------------	0-7	18-27	1.35-1.45	0.6-2	0.20-0.22	0.0-2.9	2.5-3.5	.28	.28	5	4L	86
	7-55	18-30	1.35-1.65	0.6-2	0.17-0.19	0.0-2.9	0.5-1.0	.37	.37			
	55-80	12-22	1.50-1.70	0.6-2	0.17-0.19	0.0-1.6	0.0-0.5	.37	.37			
77B:												
Sac--------------------	0-6	31-38	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	3.0-5.0	.28	.28	5	7	38
	6-16	32-39	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	2.5-4.5	.28	.28			
	16-32	30-35	1.30-1.35	0.6-2	0.18-0.20	3.0-5.9	1.0-2.0	.43	.43			
	32-80	22-28	1.50-1.65	0.6-2	0.16-0.18	0.0-2.9	0.0-1.0	.37	.37			
77C:												
Sac--------------------	0-6	31-38	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	3.0-5.0	.28	.28	5	7	38
	6-16	32-39	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	2.5-4.5	.28	.28			
	16-32	30-35	1.30-1.35	0.6-2	0.18-0.20	3.0-5.9	1.0-2.0	.43	.43			
	32-80	22-28	1.50-1.65	0.6-2	0.16-0.18	0.0-2.9	0.0-1.0	.37	.37			
77C2:												
Sac, moderately eroded	0-7	32-39	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	2.5-3.5	.28	.28	5	7	38
	7-30	30-35	1.30-1.35	0.6-2	0.18-0.20	3.0-5.9	0.5-2.0	.43	.43			
	30-80	22-28	1.50-1.65	0.6-2	0.16-0.18	0.0-2.9	0.0-0.5	.37	.37			
90:												
Okoboji mucky silty clay loam------------	0-8	20-30	1.20-1.25	0.6-2	0.22-0.25	0.1-4.2	12-18	.32	.32	5	6	48
	8-20	35-42	1.30-1.40	0.2-0.6	0.18-0.20	6.0-8.9	4.0-10	.32	.32			
	20-40	35-42	1.30-1.40	0.2-0.6	0.18-0.20	6.0-8.9	2.0-4.0	.32	.32			
	40-60	25-35	1.40-1.50	0.6-2	0.18-0.20	2.6-5.8	1.0-2.0	.28	.28			
95:												
Harps------------------	0-8	18-26	1.35-1.40	0.6-2	0.19-0.21	0.1-2.9	4.5-5.5	.24	.24	5	4L	86
	8-16	18-32	1.40-1.50	0.6-2	0.17-0.19	0.1-4.2	3.0-4.0	.32	.32			
	16-42	18-32	1.40-1.50	0.6-2	0.17-0.19	0.1-4.2	1.0-2.0	.32	.32			
	42-60	12-22	1.50-1.70	0.6-2	0.17-0.19	0.0-1.6	0.1-0.5	.37	.37			
107:												
Webster----------------	0-8	27-35	1.35-1.40	0.6-2	0.19-0.21	3.2-5.8	6.0-7.0	.28	.28	5	7	38
	8-16	27-35	1.35-1.40	0.6-2	0.19-0.21	3.2-5.8	4.0-5.0	.28	.28			
	16-32	25-35	1.40-1.50	0.6-2	0.16-0.18	2.6-5.8	2.0-3.0	.32	.32			
	32-60	12-22	1.50-1.70	0.6-2	0.17-0.19	0.0-1.6	0.0-0.5	.37	.37			
108:												
Wadena-----------------	0-7	18-27	1.30-1.50	0.6-2	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	4	6	48
	7-11	18-27	1.30-1.50	0.6-2	0.20-0.22	0.0-2.9	2.0-3.0	.24	.24			
	11-26	18-27	1.35-1.50	0.6-2	0.14-0.19	0.0-2.9	1.0-2.0	.32	.32			
	26-80	1-5	1.55-1.65	>20	0.02-0.04	0.0-2.9	0.0-0.5	.10	.10			
108B:												
Wadena-----------------	0-7	18-27	1.30-1.50	0.6-2	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	4	6	48
	7-10	18-27	1.30-1.50	0.6-2	0.20-0.22	0.0-2.9	2.0-3.0	.24	.24			
	10-25	18-27	1.35-1.50	0.6-2	0.14-0.19	0.0-2.9	1.0-2.0	.32	.32			
	25-80	1-5	1.55-1.65	>20	0.02-0.04	0.0-2.9	0.0-0.5	.10	.10			
133:												
Colo-------------------	0-8	27-36	1.28-1.32	0.6-2	0.21-0.23	3.0-5.9	5.0-7.0	.28	.28	5	7	38
	8-34	27-36	1.28-1.32	0.6-2	0.21-0.23	3.0-5.9	4.0-5.0	.28	.28			
	34-52	30-35	1.25-1.35	0.6-2	0.18-0.20	3.0-5.9	2.0-4.0	.28	.28			
	52-60	25-35	1.35-1.45	0.6-2	0.18-0.20	3.0-5.9	1.0-2.0	.32	.32			

Table 18.--Physical Properties of the Soils--Continued

Map symbol and component name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
135:												
Coland----------------	0-8	27-35	1.40-1.50	0.6-2	0.20-0.22	3.2-5.8	5.0-7.0	.24	.24	5	6	48
	8-32	27-35	1.40-1.50	0.6-2	0.20-0.22	3.2-5.8	4.0-5.0	.24	.24			
	32-40	27-35	1.40-1.50	0.6-2	0.20-0.22	3.2-5.8	2.0-4.0	.24	.24			
	40-60	12-26	1.50-1.65	0.6-6	0.13-0.17	0.0-2.9	0.0-2.0	.28	.28			
138B:												
Clarion---------------	0-7	18-24	1.40-1.45	0.6-2	0.20-0.22	0.0-2.3	3.0-4.0	.24	.24	5	6	48
	7-18	18-24	1.40-1.45	0.6-2	0.20-0.22	0.0-2.3	2.0-3.0	.24	.24			
	18-36	24-30	1.50-1.70	0.6-2	0.17-0.19	2.3-4.2	0.5-2.0	.37	.37			
	36-60	12-22	1.50-1.70	0.6-2	0.17-0.19	0.0-1.6	0.0-0.5	.37	.37			
138C2:												
Clarion, moderately eroded---------------	0-7	18-24	1.40-1.45	0.6-2	0.20-0.22	0.0-2.3	2.2-3.2	.28	.28	5	6	48
	7-16	18-24	1.40-1.45	0.6-2	0.20-0.22	0.0-2.3	1.0-2.0	.32	.32			
	16-35	18-24	1.40-1.45	0.6-2	0.20-0.22	0.0-2.3	0.5-1.0	.32	.32			
	35-60	12-22	1.50-1.70	0.6-2	0.17-0.19	0.0-1.6	0.1-0.5	.37	.37			
175:												
Dickinson-------------	0-9	10-18	1.50-1.55	2-6	0.12-0.15	0.0-2.9	2.0-3.0	.20	.20	4	3	86
	9-18	10-18	1.50-1.55	2-6	0.12-0.15	0.0-2.9	1.5-2.5	.20	.20			
	18-30	10-15	1.45-1.55	2-6	0.12-0.15	0.0-2.9	0.5-1.0	.17	.17			
	30-36	4-10	1.55-1.65	6-20	0.08-0.10	0.0-2.9	0.0-0.5	.20	.20			
	36-60	4-10	1.60-1.70	6-20	0.02-0.04	0.0-2.9	0.0-0.5	.15	.15			
175B:												
Dickinson-------------	0-9	10-18	1.50-1.55	2-6	0.12-0.15	0.0-2.9	1.5-2.5	.20	.20	4	3	86
	9-18	10-15	1.45-1.55	2-6	0.12-0.15	0.0-2.9	0.5-1.0	.17	.17			
	18-30	10-15	1.45-1.55	2-6	0.12-0.15	0.0-2.9	0.5-1.0	.17	.17			
	30-36	4-10	1.55-1.65	6-20	0.08-0.10	0.0-2.9	0.0-0.5	.20	.20			
	36-60	4-10	1.60-1.70	6-20	0.02-0.04	0.0-2.9	0.0-0.5	.15	.15			
191:												
Rushmore--------------	0-8	27-35	1.20-1.30	0.6-2	0.18-0.22	3.0-5.9	4.0-8.0	.28	.28	5	7	38
	8-18	27-35	1.20-1.30	0.6-2	0.18-0.22	3.0-5.9	4.0-8.0	.28	.28			
	18-28	27-35	1.25-1.35	0.6-2	0.15-0.19	3.0-5.9	0.5-1.0	.28	.28			
	28-62	22-32	1.40-1.70	0.2-0.6	0.17-0.19	3.0-5.9	0.0-0.5	.28	.28			
201B:												
Coland----------------	0-8	27-35	1.40-1.50	0.6-2	0.20-0.22	3.2-5.8	5.0-7.0	.24	.24	5	6	48
	8-32	27-35	1.40-1.50	0.6-2	0.20-0.22	3.2-5.8	4.0-5.0	.24	.24			
	32-40	27-35	1.40-1.50	0.6-2	0.20-0.22	3.2-5.8	2.0-4.0	.24	.24			
	40-60	12-26	1.50-1.65	0.6-6	0.13-0.17	0.0-2.9	0.0-2.0	.28	.28			
Terril----------------	0-9	18-26	1.35-1.40	0.6-2	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	5	6	48
	9-36	18-26	1.35-1.40	0.6-2	0.20-0.22	0.0-2.9	2.5-3.5	.24	.24			
	36-50	24-30	1.40-1.45	0.6-2	0.17-0.19	2.3-4.2	2.0-3.0	.28	.28			
	50-60	15-30	1.45-1.70	0.6-2	0.16-0.18	0.0-2.9	0.0-1.0	.32	.32			
202:												
Cylinder, 24 to 32 inches to sand and gravel---------------	0-8	22-27	1.40-1.45	0.6-2	0.20-0.22	3.0-5.9	4.0-5.0	.24	.24	4	6	48
	8-18	22-30	1.45-1.60	0.6-2	0.17-0.19	3.0-5.9	2.0-3.0	.32	.32			
	18-28	22-30	1.45-1.60	0.6-2	0.17-0.19	3.0-5.9	0.5-2.0	.32	.32			
	28-80	2-12	1.60-1.70	>20	0.02-0.04	0.0-2.9	0.0-0.5	.10	.15			

Table 18.--Physical Properties of the Soils--Continued

Map symbol and component name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors Kw	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
203:												
Cylinder, 32 to 40 inches to sand and gravel---------------	0-8	22-27	1.40-1.45	0.6-2	0.20-0.22	1.6-3.2	4.0-5.0	.24	.24	4	6	48
	8-18	22-27	1.40-1.45	0.6-2	0.20-0.22	1.6-3.2	2.0-3.0	.24	.24			
	18-28	22-30	1.45-1.60	0.6-2	0.17-0.19	1.6-3.2	0.5-2.0	.32	.32			
	28-80	2-12	1.60-1.70	>20	0.02-0.04	0.0-0.0	0.0-0.5	.10	.15			
221:												
Klossner--------------	0-10	0-0	0.25-0.45	0.2-6	0.35-0.45	---	20-50	.32	.32	3	2	134
	10-26	0-0	0.25-0.45	0.2-6	0.35-0.45	---	20-50	.32	.32			
	26-48	7-35	1.45-1.75	0.2-2	0.14-0.22	0.0-2.3	0.5-1.0	.37	.37			
	48-80	7-35	1.45-1.75	0.2-2	0.14-0.22	0.0-2.3	0.0-0.5	.37	.37			
259:												
Biscay----------------	0-7	18-30	1.20-1.30	0.6-2	0.20-0.22	1.3-3.2	5.5-6.5	.28	.28	4	6	48
	7-20	18-30	1.20-1.30	0.6-2	0.20-0.22	1.3-3.2	4.0-5.0	.28	.28			
	20-36	18-30	1.25-1.35	0.6-2	0.17-0.19	1.3-3.2	0.5-3.0	.28	.28			
	36-80	1-6	1.55-1.65	6-20	0.02-0.04	0.0-2.9	0.0-0.5	.05	.10			
274:												
Rolfe-----------------	0-10	22-27	1.35-1.40	0.6-2	0.22-0.24	0.0-2.9	4.0-6.0	.37	.37	5	6	48
	10-21	22-27	1.35-1.40	0.6-2	0.22-0.24	0.0-2.9	1.0-2.0	.37	.37			
	21-55	38-45	1.40-1.50	0.06-0.2	0.11-0.13	6.0-8.9	0.5-1.0	.28	.28			
	55-80	24-35	1.50-1.60	0.2-2	0.14-0.16	2.3-5.9	0.0-0.5	.28	.28			
282:												
Ransom----------------	0-8	27-38	1.20-1.30	0.6-2	0.18-0.22	3.0-5.9	4.0-6.0	.32	.32	5	7	38
	8-16	27-38	1.20-1.30	0.6-2	0.18-0.22	3.0-5.9	2.0-3.0	.32	.32			
	16-33	24-38	1.25-1.35	0.6-2	0.16-0.19	3.0-5.9	0.5-1.0	.43	.43			
	33-80	18-30	1.40-1.70	0.2-0.6	0.20-0.22	0.0-2.9	0.0-0.5	.43	.43			
308:												
Wadena, 32 to 40 inches to sand and gravel---------------	0-8	18-27	1.30-1.50	0.6-2	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	4	6	48
	8-13	18-27	1.30-1.50	0.6-2	0.20-0.22	0.0-2.9	2.0-3.0	.24	.24			
	13-34	18-27	1.35-1.50	0.6-2	0.14-0.19	1.3-3.2	1.0-2.0	.32	.32			
	34-60	1-5	1.55-1.65	>20	0.02-0.04	0.0-2.9	0.0-0.5	.10	.10			
308B:												
Wadena, 32 to 40 inches to sand and gravel---------------	0-8	18-27	1.30-1.50	0.6-2	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	4	6	48
	8-13	18-27	1.35-1.50	0.6-2	0.14-0.19	1.3-3.2	2.0-3.0	.32	.32			
	13-34	18-27	1.35-1.50	0.6-2	0.14-0.19	1.3-3.2	1.0-2.0	.32	.32			
	34-60	1-5	1.55-1.65	>20	0.02-0.04	0.0-2.9	0.0-0.5	.10	.10			
354.												
Aquolls (marsh), ponded												
375:												
Fostoria, lacustrine substratum-----------	0-7	27-35	1.35-1.40	0.6-2	0.20-0.22	0.0-2.9	5.0-6.0	.24	.24	5	4	86
	7-19	20-27	1.35-1.40	0.6-2	0.20-0.22	0.0-2.9	4.0-5.0	.24	.24			
	19-46	20-27	1.40-1.75	0.6-2	0.20-0.22	0.0-2.9	0.5-3.0	.43	.43			
	46-52	35-50	1.25-1.35	0-0.6	0.13-0.16	6.0-8.9	0.5-1.0	.28	.28			
	52-80	30-45	1.25-1.35	0-0.6	0.13-0.16	6.0-8.9	0.0-0.5	.28	.28			

Table 18.--Physical Properties of the Soils--Continued

Map symbol and component name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
376F:												
Cornell---------------	0-6	27-35	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	3.0-4.0	.32	.32	5	6	48
	6-21	27-35	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	0.0-1.0	.32	.32			
	21-43	35-45	1.55-1.75	0.2-0.6	0.16-0.18	3.0-5.9	0.0-0.5	.32	.32			
	43-80	24-33	1.65-1.75	0.2-0.6	0.16-0.18	3.0-5.9	0.0-0.5	.37	.37			
379:												
Ocheyedan, lacustrine substratum-----------	0-7	24-29	1.40-1.45	0.6-2	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	5	4	86
	7-14	24-27	1.40-1.45	0.6-2	0.20-0.22	0.0-2.9	2.0-3.0	.24	.24			
	14-40	14-24	1.45-1.60	0.6-2	0.16-0.18	0.0-2.9	0.5-1.0	.32	.32			
	40-60	12-24	1.45-1.70	0.6-2	0.19-0.21	0.0-2.9	0.0-0.5	.43	.43			
	60-80	35-45	1.25-1.35	0.06-0.6	0.13-0.16	6.0-8.9	0.0-0.5	.28	.28			
379B:												
Ocheyedan, lacustrine substratum-----------	0-7	24-29	1.40-1.45	0.6-2	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	5	4	86
	7-14	24-27	1.40-1.45	0.6-2	0.20-0.22	0.0-2.9	2.0-3.0	.24	.24			
	14-40	14-24	1.45-1.60	0.6-2	0.16-0.18	0.0-2.9	0.5-1.0	.32	.32			
	40-60	12-24	1.45-1.70	0.6-2	0.19-0.21	0.0-2.9	0.0-0.5	.43	.43			
	60-80	35-45	1.25-1.35	0.06-0.6	0.13-0.16	6.0-8.9	0.0-0.5	.28	.28			
379C2:												
Ocheyedan, lacustrine substratum, moderately eroded----	0-8	24-29	1.40-1.45	0.6-2	0.20-0.22	0.0-2.9	2.5-3.5	.24	.24	5	4	86
	8-40	14-24	1.45-1.60	0.6-2	0.16-0.18	0.0-2.9	0.5-1.0	.32	.32			
	40-60	12-24	1.45-1.70	0.6-2	0.19-0.21	0.0-2.9	0.0-0.5	.43	.43			
	60-80	35-45	1.25-1.35	0.06-0.6	0.13-0.16	6.0-8.9	0.0-0.5	.28	.28			
384:												
Collinwood------------	0-7	40-55	1.20-1.30	0.2-0.6	0.14-0.17	3.0-5.9	5.0-7.0	.32	.32	5	4	86
	7-15	39-55	1.20-1.30	0.2-0.6	0.14-0.17	3.0-5.9	3.0-5.0	.32	.32			
	15-33	34-60	1.25-1.35	0.06-0.6	0.13-0.16	6.0-8.9	1.0-3.0	.32	.32			
	33-60	35-45	1.25-1.40	0-0.6	0.11-0.15	6.0-8.9	0.5-1.0	.32	.32			
390:												
Waldorf---------------	0-9	35-45	1.20-1.30	0.06-0.6	0.18-0.25	6.0-8.9	6.0-8.0	.28	.28	5	4	86
	9-28	35-45	1.20-1.30	0.06-0.6	0.18-0.25	6.0-8.9	4.0-6.0	.28	.28			
	28-45	40-55	1.25-1.35	0.06-0.6	0.13-0.16	6.0-8.9	0.5-1.0	.32	.32			
	45-80	24-45	1.25-1.45	0.06-0.6	0.20-0.22	3.0-5.9	0.0-0.5	.32	.32			
397:												
Letri-----------------	0-8	27-35	1.20-1.30	0.6-2	0.18-0.22	3.0-5.9	4.0-8.0	.28	.28	5	6	48
	8-18	27-35	1.20-1.30	0.6-2	0.18-0.22	3.0-5.9	2.0-4.0	.28	.28			
	18-32	18-35	1.25-1.35	0.6-2	0.15-0.19	3.0-5.9	1.0-2.0	.28	.28			
	32-60	22-32	1.40-1.70	0.2-0.6	0.17-0.19	3.0-5.9	0.5-1.0	.28	.28			
433E:												
Moneta----------------	0-9	25-30	1.35-1.45	0.6-2	0.17-0.19	3.0-5.9	3.0-4.0	.28	.28	5	4L	86
	9-60	25-33	1.35-1.65	0.6-2	0.15-0.19	3.0-5.9	0.5-2.0	.37	.37			
	60-80	25-33	1.35-1.65	0.6-2	0.15-0.19	3.0-5.9	0.0-0.5	.37	.37			
433F:												
Moneta----------------	0-9	25-30	1.35-1.45	0.6-2	0.17-0.19	3.0-5.9	3.0-4.0	.28	.28	5	4L	86
	9-60	25-33	1.35-1.65	0.6-2	0.15-0.19	3.0-5.9	0.5-2.0	.37	.37			
	60-80	25-33	1.35-1.65	0.6-2	0.15-0.19	3.0-5.9	0.0-0.5	.37	.37			
433G:												
Moneta----------------	0-9	25-30	1.35-1.45	0.6-2	0.17-0.19	3.0-5.9	3.0-4.0	.28	.28	5	4L	86
	9-60	25-33	1.35-1.65	0.6-2	0.15-0.19	3.0-5.9	0.5-2.0	.37	.37			
	60-80	25-33	1.35-1.65	0.6-2	0.15-0.19	3.0-5.9	0.0-0.5	.37	.37			

Table 18.--Physical Properties of the Soils--Continued

Map symbol and component name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors Kw	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
455:												
Wilmonton	0-8	27-35	1.25-1.35	0.6-2	0.20-0.26	3.0-5.9	4.0-7.0	.28	.28	5	6	48
	8-17	27-35	1.25-1.35	0.6-2	0.20-0.26	3.0-5.9	3.0-5.0	.28	.28			
	17-25	25-32	1.30-1.45	0.2-0.6	0.15-0.19	3.0-5.9	0.5-3.0	.28	.28			
	25-55	22-32	1.45-1.70	0.2-0.6	0.14-0.19	3.0-5.9	0.5-1.0	.37	.37			
	55-80	22-32	1.45-1.70	0.2-0.6	0.14-0.19	3.0-5.9	0.5-1.0	.37	.37			
456:												
Wilmonton	0-8	27-35	1.25-1.35	0.6-2	0.20-0.26	3.0-5.9	4.0-7.0	.28	.28	5	7	38
	8-14	27-35	1.25-1.35	0.6-2	0.20-0.26	3.0-5.9	3.0-5.0	.28	.28			
	14-35	25-32	1.30-1.45	0.2-0.6	0.15-0.19	3.0-5.9	0.5-3.0	.28	.28			
	35-80	22-32	1.45-1.70	0.2-0.6	0.14-0.19	3.0-5.9	0.5-1.0	.37	.37			
485:												
Spillville	0-20	18-26	1.45-1.55	0.6-2	0.19-0.21	0.0-2.9	4.0-6.0	.24	.24	5	6	48
	20-54	18-26	1.45-1.55	0.6-2	0.19-0.21	0.0-2.9	1.0-4.0	.24	.24			
	54-80	14-24	1.55-1.70	0.6-6	0.15-0.18	0.0-2.3	0.5-2.0	.28	.28			
506:												
Wacousta	0-9	27-35	1.20-1.25	0.6-2	0.21-0.23	3.2-5.8	8.0-10	.28	.28	5	7	38
	9-14	27-35	1.20-1.25	0.6-2	0.21-0.23	3.2-5.8	7.0-9.0	.28	.28			
	14-16	24-35	1.25-1.30	0.6-2	0.18-0.20	2.3-5.8	2.0-4.0	.28	.28			
	16-60	18-30	1.30-1.40	0.6-2	0.20-0.22	0.4-4.2	0.0-1.0	.43	.43			
507:												
Canisteo	0-10	27-35	1.25-1.35	0.6-2	0.18-0.22	3.2-5.8	5.0-7.0	.24	.24	5	4L	86
	10-18	27-35	1.25-1.35	0.6-2	0.18-0.22	3.2-5.8	3.0-5.0	.24	.24			
	18-39	20-35	1.35-1.50	0.6-2	0.15-0.19	3.0-5.8	2.0-4.0	.32	.32			
	39-80	12-22	1.50-1.70	0.6-2	0.17-0.19	0.0-1.6	0.1-0.5	.37	.37			
541C:												
Estherville	0-7	5-15	1.25-1.35	2-6	0.13-0.18	0.0-2.9	1.0-2.0	.20	.20	3	3	86
	7-18	10-18	1.35-1.60	2-6	0.12-0.19	0.0-2.9	0.0-0.5	.20	.20			
	18-80	0-8	1.50-1.65	6-20	0.02-0.04	0.0-2.9	0.0-0.5	.10	.10			
Hawick	0-7	5-15	1.35-1.55	2-6	0.13-0.15	0.0-2.9	1.0-4.0	.17	.17	3	3	86
	7-11	1-10	1.50-1.65	6-20	0.03-0.10	0.0-2.9	0.0-0.5	.10	.15			
	11-73	1-5	1.55-1.65	>20	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
559:												
Talcot	0-10	30-35	1.20-1.30	0.6-2	0.18-0.22	3.0-5.9	5.0-7.0	.28	.28	4	4L	86
	10-26	30-35	1.20-1.30	0.6-2	0.18-0.22	3.0-5.9	2.0-4.0	.28	.28			
	26-30	30-35	1.25-1.35	0.6-2	0.17-0.20	3.0-5.9	1.0-2.0	.28	.28			
	30-60	1-6	1.55-1.65	6-20	0.02-0.04	0.0-2.9	0.5-1.0	.15	.15			
577B:												
Everly	0-8	27-30	1.40-1.45	0.6-2	0.17-0.19	3.0-5.9	3.0-4.0	.24	.24	5	6	48
	8-12	27-30	1.40-1.45	0.6-2	0.17-0.19	3.0-5.9	2.0-4.0	.24	.24			
	12-26	25-35	1.45-1.55	0.6-2	0.15-0.17	3.0-5.9	1.0-2.0	.32	.32			
	26-80	22-32	1.55-1.65	0.6-2	0.17-0.19	3.0-5.9	0.0-0.5	.32	.32			
577C2:												
Everly, moderately eroded	0-7	27-30	1.40-1.45	0.6-2	0.17-0.19	3.0-5.9	2.0-3.0	.28	.28	5	6	48
	7-26	25-35	1.45-1.55	0.6-2	0.15-0.17	3.0-5.9	1.0-2.0	.32	.32			
	26-80	22-32	1.55-1.65	0.6-2	0.17-0.19	3.0-5.9	0.0-0.5	.32	.32			
637D2:												
Everly, moderately eroded	0-7	27-30	1.40-1.45	0.6-2	0.17-0.19	3.0-5.9	2.0-3.0	.28	.28	5	6	48
	7-26	25-35	1.45-1.55	0.6-2	0.15-0.17	3.0-5.9	1.0-2.0	.32	.32			
	26-80	22-32	1.55-1.65	0.6-2	0.17-0.19	3.0-5.9	0.0-0.5	.32	.32			

Table 18.--Physical Properties of the Soils--Continued

Map symbol and component name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
637D2:												
Moneta, moderately eroded	0-7	25-30	1.35-1.45	0.6-2	0.17-0.19	3.0-5.9	3.0-4.0	.28	.28	5	6	48
	7-57	25-33	1.35-1.65	0.6-2	0.15-0.19	3.0-5.9	0.5-2.0	.37	.37			
	57-80	25-33	1.35-1.65	0.6-2	0.15-0.19	3.0-5.9	0.0-0.5	.37	.37			
638C2:												
Clarion, moderately eroded	0-7	18-24	1.40-1.45	0.6-2	0.20-0.22	0.0-2.3	2.0-3.0	.28	.28	5	6	48
	7-16	18-24	1.40-1.45	0.6-2	0.20-0.22	0.0-2.3	1.0-2.0	.32	.32			
	16-35	18-24	1.40-1.45	0.6-2	0.20-0.22	0.0-2.3	0.5-1.0	.32	.32			
	35-60	12-22	1.50-1.70	0.6-2	0.17-0.19	0.0-1.6	0.1-0.5	.37	.37			
Storden, moderately eroded	0-7	18-27	1.35-1.45	0.6-2	0.20-0.22	0.1-3.2	1.0-3.0	.28	.28	5	4L	86
	7-11	18-30	1.35-1.65	0.6-2	0.17-0.19	1.3-4.2	0.0-0.5	.37	.37			
	11-80	12-22	1.50-1.70	0.6-2	0.17-0.19	0.0-1.6	0.0-0.5	.37	.37			
672:												
May City	0-7	7-35	1.35-1.55	2-6	0.11-0.15	0.0-2.9	2.0-4.0	.20	.20	2	3	86
	7-19	7-35	1.55-1.65	2-6	0.10-0.19	0.0-2.9	0.5-1.0	.24	.24			
	19-80	5-30	1.50-1.80	6-20	0.02-0.04	0.0-2.9	0.0-0.5	.10	.10			
672B:												
May City	0-7	7-35	1.35-1.55	2-6	0.11-0.15	0.0-2.9	2.0-4.0	.20	.20	2	3	86
	7-19	7-35	1.55-1.65	2-6	0.10-0.19	0.0-2.9	0.5-1.0	.24	.24			
	19-80	5-30	1.50-1.80	6-20	0.02-0.04	0.0-2.9	0.0-0.5	.10	.10			
672C2:												
May City, moderately eroded	0-7	7-35	1.35-1.55	2-6	0.11-0.15	0.0-2.9	2.0-3.0	.20	.20	2	3	86
	7-17	7-35	1.55-1.65	2-6	0.10-0.19	0.0-2.9	0.0-1.0	.24	.24			
	17-80	5-30	1.50-1.80	6-20	0.02-0.04	0.0-2.9	0.0-0.5	.10	.10			
709:												
Fairhaven	0-9	18-27	1.25-1.40	0.6-2	0.22-0.24	0.0-2.9	3.0-5.0	.32	.32	4	6	48
	9-25	18-27	1.25-1.40	0.6-2	0.22-0.24	0.0-2.9	1.0-4.0	.32	.32			
	25-30	18-30	1.30-1.45	0.6-2	0.20-0.22	0.0-2.9	0.5-1.0	.43	.43			
	30-80	0-5	1.55-1.65	6-20	0.02-0.04	0.0-2.9	0.0-1.0	.10	.17			
733:												
Calco	0-9	28-33	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	5.0-7.0	.28	.28	5	4L	86
	9-27	28-33	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	4.0-5.0	.28	.28			
	27-36	30-35	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	2.0-4.0	.28	.28			
	36-80	22-32	1.30-1.45	0.6-2	0.18-0.20	3.0-5.9	1.0-2.0	.32	.32			
735:												
Havelock	0-9	27-35	1.40-1.50	0.6-2	0.20-0.22	6.0-8.9	5.0-7.0	.24	.24	5	4L	86
	9-40	27-35	1.40-1.50	0.6-2	0.20-0.22	6.0-8.9	1.0-4.0	.28	.28			
	40-73	12-26	1.50-1.65	2-6	0.13-0.17	0.0-2.9	0.0-0.5	.28	.28			
740D:												
Hawick	0-7	5-15	1.35-1.55	2-6	0.13-0.15	0.0-2.9	1.0-4.0	.17	.17	3	3	86
	7-11	1-10	1.50-1.65	6-20	0.03-0.10	0.0-2.9	0.0-0.5	.10	.15			
	11-73	1-5	1.55-1.65	>20	0.02-0.06	0.0-2.9	0.0-0.5	.10	.15			
810:												
Galva, terrace	0-6	34-39	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	4.0-5.0	.32	.32	5	4	86
	6-17	34-39	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	3.0-4.0	.32	.32			
	17-31	30-39	1.30-1.35	0.6-2	0.18-0.20	3.0-5.9	1.0-2.0	.43	.43			
	31-45	25-30	1.35-1.45	0.6-2	0.20-0.22	3.0-5.9	0.5-1.0	.43	.43			
	45-60	22-27	1.60-1.80	0.6-2	0.16-0.22	3.0-5.9	0.0-0.5	.43	.43			

Table 18.--Physical Properties of the Soils--Continued

Map symbol and component name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
810B:												
Galva, terrace	0-6	34-39	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	3.0-4.0	.32	.32	5	4	86
	6-17	34-39	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	3.0-4.0	.32	.32			
	17-31	30-39	1.30-1.35	0.6-2	0.18-0.20	3.0-5.9	1.0-2.0	.43	.43			
	31-45	25-30	1.35-1.45	0.6-2	0.20-0.22	3.0-5.9	0.0-0.5	.43	.43			
	45-60	22-27	1.60-1.80	0.6-2	0.16-0.22	3.0-5.9	0.0-0.5	.43	.43			
828B:												
Zenor	0-8	10-15	1.50-1.55	2-6	0.10-0.12	0.0-2.9	1.5-2.5	.20	.20	4	3	86
	8-33	14-18	1.55-1.60	2-6	0.09-0.11	0.0-2.9	0.0-1.0	.20	.20			
	33-60	2-8	1.60-1.75	>20	0.01-0.03	0.0-2.9	0.0-1.0	.10	.15			
828C2:												
Zenor, moderately eroded	0-8	10-15	1.50-1.55	2-6	0.10-0.12	0.0-2.9	1.0-2.0	.20	.20	4	3	86
	8-30	14-18	1.55-1.60	2-6	0.09-0.11	0.0-2.9	0.0-1.0	.20	.20			
	30-60	2-8	1.60-1.75	>20	0.01-0.03	0.0-2.9	0.0-1.0	.10	.15			
835D2:												
Storden, moderately eroded	0-7	18-27	1.35-1.45	0.6-2	0.20-0.22	0.4-2.9	1.0-3.0	.28	.28	5	4L	86
	7-11	18-30	1.35-1.65	0.6-2	0.17-0.19	0.4-4.2	0.0-0.5	.37	.37			
	11-80	12-22	1.50-1.70	0.6-2	0.17-0.19	0.0-1.6	0.0-0.5	.37	.37			
Omsrud, moderately eroded	0-7	18-24	1.40-1.45	0.6-2	0.20-0.22	0.0-2.3	2.0-3.0	.28	.28	5	4L	48
	7-24	18-24	1.40-1.45	0.6-2	0.20-0.22	0.0-2.3	1.0-2.0	.32	.32			
	24-60	12-22	1.50-1.70	0.6-2	0.17-0.19	0.0-1.6	0.0-0.5	.37	.37			
835E2:												
Storden, moderately eroded	0-7	18-27	1.35-1.45	0.6-2	0.20-0.22	0.0-2.9	1.0-3.0	.28	.28	5	4L	86
	7-11	18-22	1.55-1.75	0.6-2	0.15-0.19	0.0-2.9	0.0-1.0	.32	.32			
	11-80	12-22	1.50-1.70	0.6-2	0.17-0.19	0.0-2.9	0.0-0.5	.37	.37			
Omsrud, moderately eroded	0-7	18-24	1.40-1.45	0.6-2	0.20-0.22	0.0-2.9	2.0-3.0	.28	.28	5	4L	86
	7-24	18-24	1.40-1.45	0.6-2	0.20-0.22	0.0-2.9	1.0-2.0	.32	.32			
	24-60	12-22	1.50-1.70	0.6-2	0.17-0.19	0.0-2.9	0.0-0.5	.37	.37			
854D:												
Histosols, fens	---	---	---	0.6-6	---	---	---	---	---	-	---	---
874:												
Dickinson, lacustrine substratum	0-9	10-18	1.50-1.55	2-6	0.12-0.15	0.0-2.9	2.0-3.0	.20	.20	5	4	86
	9-30	10-18	1.50-1.55	2-6	0.12-0.15	0.0-2.9	1.0-2.5	.20	.20			
	30-36	4-10	1.55-1.65	6-20	0.08-0.10	0.0-2.9	0.0-0.5	.20	.20			
	36-67	4-10	1.60-1.70	6-20	0.02-0.04	0.0-2.9	0.0-0.5	.15	.15			
	67-80	25-45	1.35-1.45	0.6-2	0.20-0.22	3.0-5.9	0.0-0.5	.43	.43			
874B:												
Dickinson, lacustrine substratum	0-9	10-18	1.50-1.55	2-6	0.12-0.15	0.0-2.9	2.0-3.0	.20	.20	5	4	86
	9-30	10-18	1.50-1.55	2-6	0.12-0.15	0.0-2.9	1.0-2.5	.20	.20			
	30-36	4-10	1.55-1.65	6-20	0.08-0.10	0.0-2.9	0.0-0.5	.20	.20			
	36-67	4-10	1.60-1.70	6-20	0.02-0.04	0.0-2.9	0.0-0.5	.15	.15			
	67-80	25-45	1.35-1.45	0.6-2	0.20-0.22	3.0-5.9	0.0-0.5	.43	.43			

Table 18.--Physical Properties of the Soils--Continued

Map symbol and component name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
874C2:												
Dickinson, lacustrine substratum, moderately eroded----	0-8	10-18	1.50-1.55	2-6	0.12-0.15	0.0-2.9	1.0-2.0	.20	.20	5	4	86
	8-30	10-15	1.45-1.55	2-6	0.12-0.15	0.0-2.9	0.5-1.0	.17	.17			
	30-36	4-10	1.55-1.65	6-20	0.08-0.10	0.0-2.9	0.0-0.5	.20	.20			
	36-67	4-10	1.60-1.70	6-20	0.02-0.04	0.0-2.9	0.0-0.5	.15	.15			
	67-80	25-45	1.35-1.45	0.6-2	0.20-0.22	3.0-5.9	0.0-0.5	.43	.43			
875:												
Roine-----------------	0-8	10-25	1.50-1.55	2-6	0.12-0.15	0.0-2.9	2.0-3.0	.20	.20	4	3	86
	8-48	10-25	1.50-1.55	2-6	0.12-0.15	0.0-2.9	1.0-2.0	.20	.20			
	48-52	10-27	1.55-1.75	0.6-2	0.17-0.19	0.0-2.9	0.0-0.5	.37	.37			
	52-59	10-27	1.35-1.45	0.6-2	0.20-0.22	3.0-5.9	0.0-0.5	.43	.43			
	59-80	25-33	1.55-1.75	0.6-2	0.17-0.19	0.0-2.9	0.0-0.5	.37	.37			
875B:												
Roine-----------------	0-8	10-25	1.50-1.55	2-6	0.12-0.15	0.0-2.9	2.0-3.0	.20	.20	4	3	86
	8-48	10-25	1.50-1.55	2-6	0.12-0.15	0.0-2.9	1.0-2.0	.20	.20			
	48-52	10-27	1.55-1.75	0.6-2	0.17-0.19	0.0-2.9	0.0-0.5	.37	.37			
	52-59	10-27	1.35-1.45	0.6-2	0.20-0.22	3.0-5.9	0.0-0.5	.43	.43			
	59-80	25-33	1.55-1.75	0.6-2	0.17-0.19	0.0-2.9	0.0-0.5	.37	.37			
875C2:												
Roine, moderately eroded---------------	0-8	10-25	1.50-1.55	2-6	0.12-0.15	0.0-2.9	2.0-3.0	.20	.20	4	3	86
	8-45	10-25	1.50-1.55	2-6	0.12-0.15	0.0-2.9	1.0-2.0	.20	.20			
	45-52	10-27	1.55-1.75	0.6-2	0.17-0.19	0.0-2.9	0.0-0.5	.37	.37			
	52-59	10-27	1.35-1.45	0.6-2	0.20-0.22	3.0-5.9	0.0-0.5	.43	.43			
	59-80	25-33	1.55-1.75	0.6-2	0.17-0.19	0.0-2.9	0.0-0.5	.37	.37			
878:												
Ocheyedan-------------	0-7	24-27	1.40-1.45	0.6-2	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	5	6	48
	7-14	24-27	1.40-1.45	0.6-2	0.20-0.22	0.0-2.9	2.0-3.0	.24	.24			
	14-34	14-24	1.45-1.60	0.6-2	0.16-0.18	0.0-2.9	0.5-1.0	.32	.32			
	34-60	12-28	1.45-1.70	0.6-2	0.19-0.21	0.0-2.9	0.0-0.5	.43	.43			
878B:												
Ocheyedan-------------	0-7	24-27	1.40-1.45	0.6-2	0.20-0.22	0.0-2.9	3.0-4.0	.24	.24	5	6	48
	7-14	24-27	1.40-1.45	0.6-2	0.20-0.22	0.0-2.9	2.0-3.0	.24	.24			
	14-34	14-24	1.45-1.60	0.6-2	0.16-0.18	0.0-2.9	0.5-1.0	.32	.32			
	34-60	12-28	1.45-1.70	0.6-2	0.19-0.21	0.0-2.9	0.0-0.5	.43	.43			
879:												
Fostoria--------------	0-7	25-27	1.35-1.40	0.6-2	0.20-0.22	0.0-2.9	5.0-6.0	.24	.24	5	6	48
	7-19	25-30	1.35-1.40	0.6-2	0.20-0.22	0.0-2.9	3.0-5.0	.24	.24			
	19-34	16-26	1.40-1.75	0.6-2	0.20-0.22	0.0-2.9	0.5-2.0	.43	.43			
	34-80	16-26	1.40-1.75	0.6-2	0.20-0.22	0.0-2.9	0.5-1.0	.43	.43			
928:												
Annieville------------	0-8	27-35	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	3.0-5.0	.32	.32	5	4	86
	8-20	25-35	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	3.0-4.0	.32	.32			
	20-52	25-35	1.30-1.35	0.6-2	0.18-0.20	3.0-5.9	0.5-2.0	.43	.43			
	52-57	18-33	1.25-1.35	0.6-2	0.17-0.19	3.0-5.9	0.0-0.5	.28	.28			
	57-80	25-33	1.60-1.80	0.6-2	0.16-0.22	3.0-5.9	0.0-0.5	.43	.43			
928B:												
Annieville------------	0-8	27-35	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	3.0-4.0	.32	.32	5	4	86
	8-20	25-35	1.25-1.30	0.6-2	0.21-0.23	3.0-5.9	2.0-4.0	.32	.32			
	20-52	25-35	1.30-1.35	0.6-2	0.18-0.20	3.0-5.9	0.5-2.0	.43	.43			
	52-57	18-33	1.25-1.35	0.6-2	0.17-0.19	3.0-5.9	0.0-0.5	.28	.28			
	57-80	25-33	1.60-1.80	0.6-2	0.16-0.22	3.0-5.9	0.0-0.5	.43	.43			

Table 18.--Physical Properties of the Soils--Continued

Map symbol and component name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
992:												
Gillett Grove---------	0-8	36-42	1.30-1.35	0.2-0.6	0.21-0.23	6.0-8.9	6.0-8.0	.28	.28	4	4	86
	8-17	36-42	1.30-1.35	0.2-0.6	0.21-0.23	6.0-8.9	4.0-6.0	.28	.28			
	17-44	30-35	1.35-1.40	0.2-0.6	0.18-0.20	6.0-8.9	1.0-3.0	.43	.43			
	44-57	24-35	1.35-1.45	0.6-2	0.20-0.22	3.0-5.9	0.0-1.0	.43	.43			
	57-62	24-32	1.60-1.75	0.6-2	0.17-0.19	3.0-5.9	0.0-0.5	.43	.43			
1053:												
Belmann, gypsum phase	0-7	25-38	1.20-1.30	0.2-0.6	0.16-0.19	6.0-8.9	4.0-6.0	.28	.28	5	4	86
	7-57	35-40	1.20-1.30	0.2-0.6	0.16-0.19	6.0-8.9	1.0-4.0	.28	.28			
	57-80	27-45	1.25-1.35	0.06-0.6	0.13-0.16	6.0-8.9	0.0-0.5	.28	.28			
1091:												
McCreath--------------	0-6	28-35	1.25-1.30	0.6-2	0.21-0.23	6.0-8.9	5.0-6.0	.28	.28	5	4	86
	6-17	28-35	1.25-1.30	0.6-2	0.21-0.23	6.0-8.9	4.0-5.0	.28	.28			
	17-35	30-35	1.30-1.35	0.6-2	0.18-0.20	6.0-8.9	0.5-2.0	.43	.43			
	35-44	25-30	1.35-1.40	0.6-2	0.20-0.22	3.0-5.9	0.0-1.0	.43	.43			
	44-80	22-30	1.60-1.80	0.6-2	0.14-0.19	0.0-2.9	0.0-0.5	.43	.43			
1092:												
Gillett Grove---------	0-8	36-42	1.30-1.35	0.2-0.6	0.21-0.23	6.0-8.9	6.0-8.0	.28	.28	5	4	86
	8-17	36-42	1.30-1.35	0.2-0.6	0.21-0.23	6.0-8.9	4.0-6.0	.28	.28			
	17-44	30-35	1.35-1.40	0.2-0.6	0.18-0.20	6.0-8.9	1.0-3.0	.43	.43			
	44-57	24-35	1.35-1.45	0.6-2	0.20-0.22	3.0-5.9	0.0-1.0	.43	.43			
	57-62	24-32	1.60-1.75	0.6-2	0.17-0.19	3.0-5.9	0.0-0.5	.43	.43			
1133:												
Colo------------------	0-8	27-36	1.28-1.32	0.6-2	0.21-0.23	3.0-5.9	5.0-7.0	.28	.28	5	7	38
	8-34	27-36	1.28-1.32	0.6-2	0.21-0.23	3.0-5.9	4.0-6.0	.28	.28			
	34-52	30-35	1.25-1.35	0.6-2	0.18-0.20	3.0-5.9	2.0-4.0	.28	.28			
	52-60	25-35	1.35-1.45	0.6-2	0.18-0.20	3.0-5.9	1.0-2.0	.32	.32			
1259:												
Biscay, depressional--	0-7	27-30	1.20-1.30	0.6-2	0.20-0.22	3.0-5.9	6.0-10	.28	.28	4	6	48
	7-21	25-30	1.20-1.30	0.6-2	0.20-0.22	3.0-5.9	1.0-6.0	.28	.28			
	21-37	18-30	1.25-1.35	0.6-2	0.17-0.19	3.0-5.9	0.5-1.0	.28	.28			
	37-42	10-28	1.35-1.55	2-6	0.11-0.17	0.0-2.9	0.0-0.5	.28	.32			
	42-60	1-6	1.55-1.65	6-20	0.02-0.04	0.0-2.9	0.0-0.5	.05	.10			
1385:												
Ocheda----------------	0-8	35-40	1.20-1.30	0.2-0.6	0.14-0.17	3.0-5.9	5.0-6.0	.32	.32	5	4	86
	8-20	35-40	1.20-1.30	0.2-0.6	0.14-0.17	3.0-5.9	2.0-4.0	.32	.32			
	20-24	35-60	1.25-1.35	0-0.6	0.13-0.16	6.0-8.9	1.0-2.0	.32	.32			
	24-57	35-45	1.25-1.40	0-0.6	0.11-0.15	6.0-8.9	0.0-1.0	.32	.32			
	57-80	24-40	1.35-1.80	0-0.6	0.15-0.17	3.0-5.9	0.0-0.5	.37	.37			
1508:												
Belmann---------------	0-8	25-38	1.20-1.30	0.2-0.6	0.16-0.19	6.0-8.9	4.0-6.0	.28	.28	5	4	86
	8-16	25-38	1.20-1.30	0.2-0.6	0.16-0.19	6.0-8.9	4.0-6.0	.28	.28			
	16-24	27-38	1.20-1.30	0.2-0.6	0.16-0.19	6.0-8.9	2.0-4.0	.28	.28			
	24-52	35-60	1.25-1.35	0.06-0.6	0.13-0.16	6.0-8.9	0.5-3.0	.28	.28			
	52-80	27-45	1.25-1.35	0.06-0.6	0.13-0.16	6.0-8.9	0.0-1.0	.28	.28			
1585:												
Spillville------------	0-47	18-26	1.45-1.55	0.6-2	0.19-0.21	0.4-2.9	2.0-6.0	.24	.24	5	6	48
	47-80	14-24	1.55-1.70	0.6-6	0.15-0.18	0.0-2.3	0.0-2.0	.28	.28			
Coland----------------	0-39	27-35	1.40-1.50	0.6-2	0.20-0.22	3.2-5.8	2.0-7.0	.24	.24	5	6	48
	39-60	12-26	1.50-1.65	0.6-6	0.13-0.17	0.0-2.9	0.0-2.0	.28	.28			
5010.												
Pits, sand and gravel												

Table 18.--Physical Properties of the Soils--Continued

Map symbol and component name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors Kw	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
5040.												
Udorthents, loamy												
5060.												
Pits, clay												
AW.												
Animal waste												
SL.												
Sewage lagoon												
W.												
Water												

Table 19.--Chemical Properties of the Soils

(Absence of an entry indicates that data were not estimated)

Map symbol and component name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
6:					
Okoboji	0-6	41-41	6.6-7.8	0-15	---
	6-32	41-41	6.6-7.8	0-15	---
	32-56	41-45	6.6-7.8	0-15	---
	56-60	30-36	7.6-8.4	5-30	---
27B:					
Terril	0-9	20-25	6.1-7.3	0	---
	9-36	20-25	6.1-7.3	0	---
	36-50	20-25	6.1-7.3	0	---
	50-60	15-25	6.1-7.8	0-15	---
27C:					
Terril	0-9	20-25	6.1-7.3	0	---
	9-36	20-25	6.1-7.3	0	---
	36-50	20-25	6.1-7.3	0	---
	50-60	15-25	6.1-7.8	0-15	---
27D:					
Terril	0-9	20-25	6.1-7.3	0	---
	9-36	20-25	6.1-7.3	0	---
	36-50	20-25	6.1-7.3	0	---
	50-60	15-25	6.1-7.8	0-15	---
31:					
Afton	0-7	30-36	6.1-7.8	0-10	---
	7-32	30-36	6.1-7.8	0-10	---
	32-43	30-36	7.6-8.4	5-30	---
	51-65	30-36	7.6-8.4	5-30	---
	65-80	25-30	7.6-8.4	5-30	---
34B:					
Estherville	0-7	15-20	5.6-7.3	0	---
	7-18	5.0-20	5.6-7.3	0	---
	18-80	0.0-10	6.6-8.4	0-20	---
41C:					
Sparta	0-11	2.0-12	5.6-7.3	0	---
	11-15	1.0-6.0	5.1-7.3	0	---
	15-60	1.0-4.0	5.1-7.8	0	---
48:					
Knoke	0-8	41-41	7.6-8.4	5-30	---
	8-15	41-41	7.6-8.4	5-30	---
	15-39	36-41	7.6-8.4	5-30	---
	39-80	36-41	7.6-8.4	5-30	---
54:					
Zook	0-6	36-41	5.6-7.3	0	---
	6-20	36-41	5.6-7.3	0	---
	20-60	36-41	5.6-7.8	0	---
55:					
Nicollet	0-10	20-25	6.1-7.3	0	---
	10-17	20-25	6.1-7.3	0	---
	17-36	15-25	5.6-7.8	0-15	---
	36-60	20-25	7.6-8.4	5-30	---

Table 19.--Chemical Properties of the Soils--Continued

Map symbol and component name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
62F:					
Storden	0-7	15-20	7.6-8.4	5-30	---
	7-55	15-20	7.6-8.4	5-30	---
	55-80	20-25	7.6-8.4	5-30	---
77B:					
Sac	0-6	36-41	5.6-7.3	0	---
	6-16	36-41	5.6-7.3	0	---
	16-32	36-41	5.6-7.3	0	---
	32-80	30-36	6.6-8.4	0-30	---
77C:					
Sac	0-6	36-41	5.6-7.3	0	---
	6-16	36-41	5.6-7.3	0	---
	16-32	36-41	5.6-7.3	0	---
	32-80	30-36	6.6-8.4	0-30	---
77C2:					
Sac, moderately eroded	0-7	36-41	5.6-7.3	---	---
	7-30	36-41	5.6-7.3	---	---
	30-80	30-36	6.6-8.4	0-30	---
90:					
Okoboji mucky silty clay loam	0-8	41-41	6.1-7.8	0-15	---
	8-20	41-45	6.6-7.8	0-15	---
	20-40	41-45	6.6-7.8	0-15	---
	40-60	30-36	7.6-8.4	5-30	---
95:					
Harps	0-8	36-41	7.9-8.4	20-30	---
	8-16	25-30	7.9-8.4	20-30	---
	16-42	25-30	7.9-8.4	20-30	---
	42-60	20-25	7.6-8.4	5-30	---
107:					
Webster	0-8	36-41	6.6-7.3	0	---
	8-16	36-41	6.6-7.3	0	---
	16-32	35-41	6.6-7.8	5-10	---
	32-60	20-25	7.6-8.4	5-30	---
108:					
Wadena	0-7	5.0-25	6.1-7.3	0	---
	7-11	5.0-25	6.1-7.3	0	---
	11-26	5.0-20	5.6-7.3	0	---
	26-80	0.0-5.0	6.6-8.4	0-15	---
108B:					
Wadena	0-7	5.0-25	6.1-7.3	0	---
	7-10	5.0-25	6.1-7.3	0	---
	10-25	5.0-20	5.6-7.3	0	---
	25-80	0.0-5.0	6.6-8.4	0-15	---
133:					
Colo	0-8	36-41	5.6-7.3	0	---
	8-34	36-41	5.6-7.3	0	---
	34-52	36-41	5.6-7.3	0	---
	52-60	30-36	6.1-7.3	0	---

Table 19.--Chemical Properties of the Soils--Continued

Map symbol and component name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
135:					
Coland---------------	0-8	30-36	6.1-7.3	0	---
	8-32	30-36	6.1-7.3	0	---
	32-40	30-36	6.1-7.3	0	---
	40-60	20-30	6.1-7.8	0-20	---
138B:					
Clarion--------------	0-7	20-25	5.6-7.3	0	---
	7-18	20-25	5.6-7.3	0	---
	18-36	20-25	5.6-7.8	0-15	---
	36-60	20-25	7.6-8.4	5-30	---
138C2:					
Clarion, moderately eroded--------------	0-7	20-25	5.6-7.3	0	---
	7-16	20-25	5.6-7.3	0	---
	16-35	20-25	5.6-7.8	0-15	---
	35-60	20-25	7.6-8.4	5-30	---
175:					
Dickinson------------	0-9	15-20	5.6-7.3	0	---
	9-18	15-20	5.6-7.3	0	---
	18-30	15-20	5.1-6.5	0	---
	30-36	5.0-10	5.1-6.5	0	---
	36-60	5.0-10	5.6-7.3	0	---
175B:					
Dickinson------------	0-9	15-20	5.6-7.3	0	---
	9-18	15-20	5.1-6.5	0	---
	18-30	15-20	5.1-6.5	0	---
	30-36	5.0-10	5.1-6.5	0	---
	36-60	5.0-10	5.6-7.3	0	---
191:					
Rushmore-------------	0-8	36-41	6.1-7.8	0	---
	8-18	36-41	6.1-7.8	0	---
	18-28	36-41	6.1-7.8	0-30	---
	28-62	30-36	6.6-8.4	0-30	---
201B:					
Coland---------------	0-8	30-36	6.1-7.3	0	---
	8-32	30-36	6.1-7.3	0	---
	32-40	30-36	6.1-7.3	0	---
	40-60	20-30	6.1-7.8	0-20	---
Terril---------------	0-9	20-25	6.1-7.3	0	---
	9-36	20-25	6.1-7.3	0	---
	36-50	20-25	6.1-7.3	0	---
	50-60	15-25	6.1-7.8	0-15	---
202:					
Cylinder, 24 to 32 inches to sand and gravel-------------	0-8	20-25	5.6-7.3	0	---
	8-18	20-25	6.1-7.3	0	---
	18-28	20-25	6.1-7.3	0	---
	28-80	5.0-10	6.6-8.4	0-25	---

Table 19.--Chemical Properties of the Soils--Continued

Map symbol and component name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
203:					
Cylinder, 32 to 40 inches to sand and gravel	0-8	20-25	5.6-7.3	0	---
	8-18	20-25	5.6-7.3	0	---
	18-28	20-25	6.1-7.3	0	---
	28-80	5.0-10	6.6-8.4	0-25	---
221:					
Klossner	0-10	65-65	5.1-7.4	0	---
	10-26	65-65	5.1-7.4	0	---
	26-48	2.0-15	6.1-8.4	0-30	---
	48-80	2.0-15	6.1-8.4	0-30	---
259:					
Biscay	0-7	30-36	6.1-7.4	0-15	---
	7-20	30-36	6.1-7.4	0-15	---
	20-36	12-25	6.6-7.8	0-15	---
	36-80	1.0-5.0	7.6-8.4	5-30	---
274:					
Rolfe	0-10	20-25	5.1-7.3	0	---
	10-21	20-25	5.1-7.3	0	---
	21-55	20-30	6.1-7.3	0	---
	55-80	20-25	6.1-8.4	0-25	---
282:					
Ransom	0-8	36-41	6.6-7.3	0	---
	8-16	36-41	6.6-7.3	0	---
	16-33	36-41	6.6-7.8	0	---
	33-80	30-36	7.4-8.4	0-30	---
308:					
Wadena, 32 to 40 inches to sand and gravel	0-8	20-25	6.1-7.3	0	---
	8-13	20-25	6.1-7.3	0	---
	13-34	20-25	5.6-7.3	0	---
	34-60	0.0-5.0	6.6-8.4	0-15	---
308B:					
Wadena, 32 to 40 inches to sand and gravel	0-8	20-25	6.1-7.3	0	---
	8-13	20-25	5.6-7.3	0	---
	13-34	20-25	5.6-7.3	0	---
	34-60	0.0-5.0	6.6-8.4	0-15	---
354.					
Aquolls (marsh), ponded					
375:					
Fostoria, lacustrine substratum	0-7	25-30	6.1-7.3	0	---
	7-19	25-30	6.1-7.3	0	---
	19-46	15-25	7.6-8.4	0-15	---
	46-52	26-50	5.6-7.3	0-30	---
	52-80	26-50	5.6-7.3	0-30	---

Table 19.--Chemical Properties of the Soils--Continued

Map symbol and component name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
376F:					
Cornell-------------	0-6	36-41	5.6-7.3	0	---
	6-21	36-41	5.6-7.3	0	---
	21-43	20-25	4.5-6.5	0	---
	43-80	20-25	6.6-8.4	0-25	---
379:					
Ocheyedan, lacustrine substratum----------	0-7	20-25	5.6-7.3	0	---
	7-14	20-25	5.6-7.3	0	---
	14-40	20-25	6.1-7.8	0-15	---
	40-60	20-25	6.6-8.4	0-30	---
	60-80	26-50	5.6-7.3	0-30	---
379B:					
Ocheyedan, lacustrine substratum----------	0-7	20-25	5.6-7.3	0	---
	7-14	20-25	5.6-7.3	0	---
	14-40	20-25	6.1-7.8	0-15	---
	40-60	20-25	6.6-8.4	0-30	---
	60-80	26-50	5.6-7.3	0-30	---
379C2:					
Ocheyedan, lacustrine substratum, moderately eroded---	0-8	20-25	5.6-7.3	0	---
	8-40	20-25	6.1-7.8	0-15	---
	40-60	20-25	6.6-8.4	0-30	---
	60-80	26-50	5.6-7.3	0-30	---
384:					
Collinwood-----------	0-7	35-42	5.6-7.3	0	---
	7-15	35-42	5.6-7.3	0	---
	15-33	26-50	5.6-7.3	0	---
	33-60	26-50	7.4-8.4	0-30	---
390:					
Waldorf--------------	0-9	36-52	6.1-7.3	0	---
	9-28	36-52	6.1-7.3	0	---
	28-45	25-46	6.6-7.8	0-15	---
	45-80	14-37	7.6-8.4	15-30	---
397:					
Letri----------------	0-8	30-36	6.1-7.8	0	---
	8-18	30-36	6.1-7.8	0	---
	18-32	30-36	6.1-7.8	5-25	---
	32-60	20-30	6.6-8.4	5-25	---
433E:					
Moneta---------------	0-9	16-19	7.6-8.4	5-30	---
	9-60	9.0-18	7.6-8.4	15-30	---
	60-80	9.0-18	7.6-8.4	10-20	---
433F:					
Moneta---------------	0-9	16-19	7.6-8.4	5-30	---
	9-60	9.0-18	7.6-8.4	15-30	---
	60-80	9.0-18	7.6-8.4	10-20	---
433G:					
Moneta---------------	0-9	16-19	7.6-8.4	5-30	---
	9-60	9.0-18	7.6-8.4	15-30	---
	60-80	9.0-18	7.6-8.4	10-20	---

Table 19.--Chemical Properties of the Soils--Continued

Map symbol and component name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
455:					
Wilmonton	0-8	30-36	6.1-7.3	0	---
	8-17	30-36	6.1-7.3	0	---
	17-25	30-36	6.1-7.8	0	---
	25-55	20-30	7.6-8.4	5-30	---
	55-80	20-30	7.6-8.4	5-30	---
456:					
Wilmonton	0-8	30-36	6.1-7.3	0	---
	8-14	30-36	6.1-7.3	0	---
	14-35	30-36	6.1-7.8	0	---
	35-80	20-30	7.6-8.4	5-30	---
485:					
Spillville	0-20	20-25	5.6-7.3	0	---
	20-54	20-25	5.6-7.3	0	---
	54-80	20-25	5.6-7.3	0	---
506:					
Wacousta	0-9	41-41	6.1-7.3	0-15	---
	9-14	41-41	6.1-7.3	0-15	---
	14-16	30-35	6.6-7.8	0-15	---
	16-60	25-30	7.6-8.4	5-30	---
507:					
Canisteo	0-10	36-41	7.6-8.4	5-15	---
	10-18	36-41	7.6-8.4	5-15	---
	18-39	12-29	7.6-8.4	12-18	---
	39-80	20-25	7.6-8.4	5-30	---
541C:					
Estherville	0-7	15-20	5.6-7.3	---	---
	7-18	4.0-20	5.6-7.3	---	---
	18-80	0.0-5.0	6.6-8.4	0-20	---
Hawick	0-7	1.0-10	6.1-7.8	0-10	---
	7-11	1.0-5.0	6.1-7.8	0-10	---
	11-73	1.0-5.0	7.6-8.4	5-15	---
559:					
Talcot	0-10	30-36	7.6-8.4	5-30	---
	10-26	30-36	7.6-8.4	5-30	---
	26-30	30-36	7.6-8.4	5-30	---
	30-60	1.0-5.0	7.6-8.4	5-30	---
577B:					
Everly	0-8	25-30	5.6-7.3	0	---
	8-12	25-30	5.6-7.3	0	---
	12-26	25-30	6.1-7.3	0	---
	26-80	25-30	7.6-8.4	5-30	---
577C2:					
Everly, moderately eroded	0-7	25-30	5.6-7.3	0	---
	7-26	25-30	6.1-7.3	0	---
	26-80	25-30	7.6-8.4	5-30	---
637D2:					
Everly, moderately eroded	0-7	25-30	5.6-7.3	0	---
	7-26	25-30	6.1-7.3	0	---
	26-80	25-30	7.6-8.4	5-30	---

Table 19.--Chemical Properties of the Soils--Continued

Map symbol and component name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
637D2:					
Moneta, moderately eroded	0-7	16-19	7.6-8.4	5-30	---
	7-57	9.0-18	7.6-8.4	15-30	---
	57-80	9.0-18	7.6-8.4	10-20	---
638C2:					
Clarion, moderately eroded	0-7	20-25	5.6-7.3	0	---
	7-16	20-25	5.6-7.3	0	---
	16-35	20-25	5.6-7.3	0	---
	35-60	20-25	7.6-8.4	5-30	---
Storden, moderately eroded	0-7	15-20	7.6-8.4	5-30	---
	7-11	7.0-18	7.6-8.4	5-30	---
	11-80	20-25	7.6-8.4	5-30	---
672:					
May City	0-7	15-20	5.6-6.5	0	0
	7-19	4.0-15	5.1-6.5	0	0
	19-80	0.0-6.0	5.6-6.5	0	0
672B:					
May City	0-7	15-20	5.6-6.5	0	0
	7-19	4.0-15	5.1-6.5	0	0
	19-80	0.0-6.0	5.6-6.5	0	0
672C2:					
May City, moderately eroded	0-7	15-20	5.6-6.5	0	0
	7-17	4.0-15	5.1-6.5	0	0
	17-80	0.0-6.0	5.6-6.5	0	0
709:					
Fairhaven	0-9	20-30	5.6-7.3	0	---
	9-25	20-30	5.6-7.3	0	---
	25-30	15-25	5.6-7.3	0	---
	30-80	0.0-5.0	6.1-8.4	0-15	---
733:					
Calco	0-9	36-41	7.6-8.4	5-30	---
	9-27	36-41	7.6-8.4	5-30	---
	27-36	36-41	7.6-8.4	5-30	---
	36-80	36-41	7.6-8.4	5-30	---
735:					
Havelock	0-9	30-36	7.6-8.4	5-30	---
	9-40	30-36	7.6-8.4	5-30	---
	40-73	10-20	7.6-8.4	5-30	---
740D:					
Hawick	0-7	1.0-10	6.1-7.8	0-10	---
	7-11	1.0-5.0	6.1-7.8	0-10	---
	11-73	1.0-5.0	7.6-8.4	5-15	---
810:					
Galva, terrace	0-6	36-41	5.6-7.3	0	---
	6-17	36-41	5.6-7.3	0	---
	17-31	36-41	6.1-7.3	0	---
	31-45	36-41	6.6-8.4	0-25	---
	45-60	36-41	7.6-8.4	5-30	---

Table 19.--Chemical Properties of the Soils--Continued

Map symbol and component name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
810B:					
Galva, terrace-------	0-6	36-41	5.6-7.3	0	---
	6-17	36-41	5.6-7.3	0	---
	17-31	36-41	6.1-7.3	0	---
	31-45	36-41	6.6-8.4	0-25	---
	45-60	36-41	7.6-8.4	5-30	---
828B:					
Zenor----------------	0-8	15-20	5.6-7.3	0	---
	8-33	15-20	6.1-8.4	0	---
	33-60	3.0-10	7.9-8.4	0-10	---
828C2:					
Zenor, moderately eroded--------------	0-8	15-20	5.6-7.3	0	---
	8-30	15-20	6.1-8.4	0	---
	30-60	3.0-10	7.9-8.4	0-10	---
835D2:					
Storden, moderately eroded--------------	0-7	15-20	7.6-8.4	5-30	---
	7-11	7.0-18	7.6-8.4	5-30	---
	11-80	20-25	7.6-8.4	5-30	---
Omsrud, moderately eroded--------------	0-7	15-25	5.6-8.4	0	---
	7-24	20-25	5.6-7.3	0	---
	24-60	20-25	7.6-8.4	5-30	---
835E2:					
Storden, moderately eroded--------------	0-7	11-18	7.6-8.4	5-25	---
	7-11	9.0-17	7.6-8.4	5-25	---
	11-80	20-25	7.6-8.4	5-30	---
Omsrud, moderately eroded--------------	0-7	15-25	5.6-8.4	0	---
	7-24	20-25	5.6-7.3	0	---
	24-60	20-25	7.6-8.4	5-30	---
854D.					
Histosols, fens					
874:					
Dickinson, lacustrine substratum----------	0-9	15-20	5.6-7.3	0	---
	9-30	15-20	5.6-7.3	0	---
	30-36	5.0-10	5.1-6.5	0	---
	36-67	5.0-10	5.6-7.3	0	---
	67-80	36-50	6.6-8.4	0-25	---
874B:					
Dickinson, lacustrine substratum----------	0-9	15-20	5.6-7.3	0	---
	9-30	15-20	5.6-7.3	0	---
	30-36	5.0-10	5.1-6.5	0	---
	36-67	5.0-10	5.6-7.3	0	---
	67-80	36-50	6.6-8.4	0-25	---

Table 19.--Chemical Properties of the Soils--Continued

Map symbol and component name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
874C2:					
Dickinson, lacustrine substratum, moderately eroded---	0-8	15-20	5.6-7.3	0	---
	8-30	15-20	5.1-6.5	0	---
	30-36	5.0-10	5.1-6.5	0	---
	36-67	5.0-10	5.6-7.3	0	---
	67-80	36-50	6.6-8.4	0-25	---
875:					
Roine----------------	0-8	15-20	5.6-7.3	0	---
	8-48	15-20	5.6-7.3	0	---
	48-52	15-20	5.6-6.5	0	---
	52-59	36-41	6.6-8.4	0-25	---
	59-80	15-20	5.6-6.5	0	---
875B:					
Roine----------------	0-8	15-20	5.6-7.3	0	---
	8-48	15-20	5.6-7.3	0	---
	48-52	15-20	5.6-6.5	0	---
	52-59	36-41	6.6-8.4	0-25	---
	59-80	15-20	5.6-6.5	0	---
875C2:					
Roine, moderately eroded--------------	0-8	15-20	5.6-7.3	0	---
	8-45	15-20	5.6-7.3	0	---
	45-52	15-20	5.6-6.5	0	---
	52-59	36-41	6.6-8.4	0-25	---
	59-80	15-20	5.6-6.5	0	---
878:					
Ocheyedan------------	0-7	20-25	5.6-7.3	0	---
	7-14	20-25	5.6-7.3	0	---
	14-34	20-25	6.1-7.8	0-15	---
	34-60	20-25	6.6-8.4	0-30	---
878B:					
Ocheyedan------------	0-7	20-25	5.6-7.3	0	---
	7-14	20-25	5.6-7.3	0	---
	14-34	20-25	6.1-7.8	0-15	---
	34-60	20-25	6.6-8.4	0-30	---
879:					
Fostoria-------------	0-7	25-30	6.1-7.3	0	---
	7-19	25-30	6.1-7.3	0	---
	19-34	15-25	7.6-8.4	5-25	---
	34-80	15-25	7.6-8.4	5-25	---
928:					
Annieville-----------	0-8	36-41	5.6-7.3	0	---
	8-20	36-41	5.6-7.3	0	---
	20-52	36-41	6.1-7.3	0	---
	52-57	12-25	6.6-7.8	0-15	---
	57-80	36-41	7.6-8.4	5-30	---
928B:					
Annieville-----------	0-8	36-41	5.6-7.3	0	---
	8-20	36-41	5.6-7.3	0	---
	20-52	36-41	6.1-7.3	0	---
	52-57	12-25	6.6-7.8	0-15	---
	57-80	36-41	7.6-8.4	5-30	---

Table 19.--Chemical Properties of the Soils--Continued

Map symbol and component name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
992:					
Gillett Grove	0-8	41-45	6.1-7.8	0-15	---
	8-17	41-45	6.1-7.8	0-15	---
	17-44	41-45	6.1-8.4	0-25	---
	44-57	36-41	7.9-8.4	20-30	---
	57-62	30-36	7.9-8.4	20-30	---
1053:					
Belmann, gypsum phase	0-7	36-41	5.6-7.3	0	5-15
	7-57	36-41	5.6-7.3	0	10-20
	57-80	36-41	5.6-7.3	0	10-20
1091:					
McCreath	0-6	41-45	5.6-7.3	0	---
	6-17	41-45	5.6-7.3	0	---
	17-35	36-41	6.1-8.4	0-30	---
	35-44	30-36	7.9-8.4	15-30	---
	44-80	30-36	7.9-8.4	15-30	---
1092:					
Gillett Grove	0-8	41-45	6.1-7.8	0-15	---
	8-17	41-45	6.1-7.8	0-15	---
	17-44	41-45	6.1-8.4	0-25	---
	44-57	36-41	7.9-8.4	20-30	---
	57-62	30-36	7.9-8.4	20-30	---
1133:					
Colo	0-8	36-41	5.6-7.3	0	---
	8-34	36-41	5.6-7.3	0	---
	34-52	36-41	5.6-7.3	0	---
	52-60	30-36	6.1-7.3	0	---
1259:					
Biscay, depressional	0-7	30-36	6.1-7.8	0-15	---
	7-21	30-36	6.1-7.8	0-15	---
	21-37	12-25	6.6-7.8	0-15	---
	37-42	5.0-20	6.6-7.8	0-15	---
	42-60	1.0-5.0	7.6-8.4	5-30	---
1385:					
Ocheda	0-8	41-41	5.6-7.3	0	---
	8-20	41-41	5.6-7.3	0	---
	20-24	25-35	5.6-7.3	0	---
	24-57	15-25	7.4-8.4	0-15	---
	57-80	25-40	6.6-8.4	0-30	---
1508:					
Belmann	0-8	36-41	5.6-7.3	5-15	---
	8-16	36-41	5.6-7.3	5-15	---
	16-24	36-41	5.6-7.3	10-20	---
	24-52	36-50	5.6-7.3	10-20	---
	52-80	36-50	5.6-7.3	10-20	---
1585:					
Spillville	0-47	20-25	5.6-7.3	0	---
	47-80	20-25	5.6-7.3	0	---
Coland	0-39	30-36	6.1-7.3	0	---
	39-60	20-30	6.1-7.8	0-20	---
5010.					
Pits, sand and gravel					

Table 19.--Chemical Properties of the Soils--Continued

Map symbol and component name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum
	In	meq/100 g	pH	Pct	Pct
5040.					
Udorthents, loamy					
5060.					
Pits, clay					
AW.					
Animal waste					
SL.					
Sewage lagoon					
W.					
Water					

Table 20.--Water Features

(See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
6:									
Okoboji	B/D								
		January	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		February	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		March	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		April	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		May	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		June	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		July	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		August	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		September	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		October	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		November	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		December	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
27B:									
Terril	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
27C:									
Terril	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
27D:									
Terril	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
31:									
Afton	C/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	---	None
		March	0.0-1.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.0-1.0	>6.0	---	---	None	---	None
		June	0.0-1.0	>6.0	---	---	None	---	None
		July	0.0-1.0	>6.0	---	---	None	---	None
		August	0.0-6.0	>6.0	---	---	None	---	None
		September	0.0-6.0	>6.0	---	---	None	---	None
		October	0.0-6.0	>6.0	---	---	None	---	None
		November	0.0-1.0	>6.0	---	---	None	---	None
		December	0.0-1.0	>6.0	---	---	None	---	None
34B:									
Estherville	B								
		Jan-Dec	---	---	---	---	None	---	None
41C:									
Sparta	A								
		Jan-Dec	---	---	---	---	None	---	None
48:									
Knoke	B/D								
		January	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		February	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		March	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		April	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		May	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		June	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		July	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		August	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		September	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		October	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		November	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		December	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table Upper limit	Water table Lower limit	Ponding Surface water depth	Ponding Duration	Ponding Frequency	Flooding Duration	Flooding Frequency
			Ft	Ft	Ft				
54:									
Zook	C/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	Long	Occasional
		March	0.0-1.0	>6.0	---	---	None	Long	Occasional
		April	0.0-1.0	>6.0	---	---	None	Long	Occasional
		May	0.0-1.0	>6.0	---	---	None	Long	Occasional
		June	0.0-1.0	>6.0	---	---	None	Long	Occasional
		July	0.0-1.0	>6.0	---	---	None	Long	Occasional
		August	0.0-6.0	>6.0	---	---	None	Long	Occasional
		September	0.0-6.0	>6.0	---	---	None	Long	Occasional
		October	0.0-6.0	>6.0	---	---	None	Long	Occasional
		November	0.0-1.0	>6.0	---	---	None	Long	Occasional
		December	0.0-1.0	>6.0	---	---	None	---	None
55:									
Nicollet	B								
		January	1.0-3.5	>6.0	---	---	None	---	None
		February	1.0-3.5	>6.0	---	---	None	---	None
		March	1.0-3.5	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.0-3.5	>6.0	---	---	None	---	None
		June	1.0-3.5	>6.0	---	---	None	---	None
		July	1.0-3.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	3.5-6.0	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	1.0-3.5	>6.0	---	---	None	---	None
		December	1.0-3.5	>6.0	---	---	None	---	None
62F:									
Storden	B								
		Jan-Dec	---	---	---	---	None	---	None
77B:									
Sac	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
77C:									
Sac	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
77C2:									
Sac, moderately eroded	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
90:									
Okoboji mucky silty clay loam	B/D								
		January	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		February	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		March	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		April	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		May	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		June	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		July	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		August	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		September	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		October	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		November	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		December	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
95:									
Harps	B/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	---	None
		March	0.0-1.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.0-1.0	>6.0	---	---	None	---	None
		June	0.0-1.0	>6.0	---	---	None	---	None
		July	0.0-1.0	>6.0	---	---	None	---	None
		August	0.0-6.0	>6.0	---	---	None	---	None
		September	0.0-6.0	>6.0	---	---	None	---	None
		October	0.0-6.0	>6.0	---	---	None	---	None
		November	0.0-1.0	>6.0	---	---	None	---	None
		December	0.0-1.0	>6.0	---	---	None	---	None
107:									
Webster	B/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	---	None
		March	0.0-1.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.0-1.0	>6.0	---	---	None	---	None
		June	0.0-1.0	>6.0	---	---	None	---	None
		July	0.0-1.0	>6.0	---	---	None	---	None
		August	0.0-6.0	>6.0	---	---	None	---	None
		September	0.0-6.0	>6.0	---	---	None	---	None
		October	0.0-6.0	>6.0	---	---	None	---	None
		November	0.0-1.0	>6.0	---	---	None	---	None
		December	0.0-1.0	>6.0	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
108:									
Wadena	B								
		Jan-Dec	---	---	---	---	None	---	None
108B:									
Wadena	B								
		Jan-Dec	---	---	---	---	None	---	None
133:									
Colo	B/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		March	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		April	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		May	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		June	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		July	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		August	0.0-6.0	>6.0	---	---	None	Brief	Occasional
		September	0.0-6.0	>6.0	---	---	None	Brief	Occasional
		October	0.0-6.0	>6.0	---	---	None	Brief	Occasional
		November	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		December	0.0-1.0	>6.0	---	---	None	---	None
135:									
Coland	B/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		March	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		April	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		May	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		June	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		July	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		August	0.0-6.0	>6.0	---	---	None	Brief	Occasional
		September	0.0-6.0	>6.0	---	---	None	Brief	Occasional
		October	0.0-6.0	>6.0	---	---	None	Brief	Occasional
		November	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		December	0.0-1.0	>6.0	---	---	None	---	None
138B:									
Clarion	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
138C2:									
Clarion, moderately eroded	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
175:									
Dickinson-----------------	B								
		Jan-Dec	---	---	---	---	None	---	None
175B:									
Dickinson-----------------	B								
		Jan-Dec	---	---	---	---	None	---	None
191:									
Rushmore------------------	B/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	---	None
		March	0.0-1.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.0-1.0	>6.0	---	---	None	---	None
		June	0.0-1.0	>6.0	---	---	None	---	None
		July	0.0-1.0	>6.0	---	---	None	---	None
		August	0.0-6.0	>6.0	---	---	None	---	None
		September	0.0-6.0	>6.0	---	---	None	---	None
		October	0.0-6.0	>6.0	---	---	None	---	None
		November	0.0-1.0	>6.0	---	---	None	---	None
		December	0.0-1.0	>6.0	---	---	None	---	None
201B:									
Coland--------------------	B/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		March	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		April	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		May	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		June	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		July	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		August	0.0-6.0	>6.0	---	---	None	Brief	Occasional
		September	0.0-6.0	>6.0	---	---	None	Brief	Occasional
		October	0.0-6.0	>6.0	---	---	None	Brief	Occasional
		November	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		December	0.0-1.0	>6.0	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
201B:									
Terril	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
202:									
Cylinder, 24 to 32 inches to sand and gravel	B								
		January	1.0-3.5	>6.0	---	---	None	---	None
		February	1.0-3.5	>6.0	---	---	None	---	None
		March	1.0-3.5	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.0-3.5	>6.0	---	---	None	---	None
		June	1.0-3.5	>6.0	---	---	None	---	None
		July	1.0-3.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	3.5-6.0	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	1.0-3.5	>6.0	---	---	None	---	None
		December	1.0-3.5	>6.0	---	---	None	---	None
203:									
Cylinder, 32 to 40 inches to sand and gravel	B								
		January	1.0-3.5	>6.0	---	---	None	---	None
		February	1.0-3.5	>6.0	---	---	None	---	None
		March	1.0-3.5	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.0-3.5	>6.0	---	---	None	---	None
		June	1.0-3.5	>6.0	---	---	None	---	None
		July	1.0-3.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	3.5-6.0	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	1.0-3.5	>6.0	---	---	None	---	None
		December	1.0-3.5	>6.0	---	---	None	---	None
221:									
Klossner	A/D								
		January	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		February	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		March	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		April	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		May	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		June	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		July	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		August	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		September	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		October	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		November	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		December	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
259:									
Biscay	B/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	---	None
		March	0.0-1.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.0-1.0	>6.0	---	---	None	---	None
		June	0.0-1.0	>6.0	---	---	None	---	None
		July	0.0-1.0	>6.0	---	---	None	---	None
		August	0.0-6.0	>6.0	---	---	None	---	None
		September	0.0-6.0	>6.0	---	---	None	---	None
		October	0.0-6.0	>6.0	---	---	None	---	None
		November	0.0-1.0	>6.0	---	---	None	---	None
		December	0.0-1.0	>6.0	---	---	None	---	None
274:									
Rolfe	C								
		January	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		February	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		March	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		April	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		May	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		June	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		July	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		August	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		September	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		October	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		November	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		December	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
282:									
Ransom	B								
		January	1.0-3.5	>6.0	---	---	None	---	None
		February	1.0-3.5	>6.0	---	---	None	---	None
		March	1.0-3.5	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.0-3.5	>6.0	---	---	None	---	None
		June	1.0-3.5	>6.0	---	---	None	---	None
		July	1.0-3.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	3.5-6.0	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	1.0-3.5	>6.0	---	---	None	---	None
		December	1.0-3.5	>6.0	---	---	None	---	None
308:									
Wadena, 32 to 40 inches to sand and gravel	B								
		Jan-Dec	---	---	---	---	None	---	None
308B:									
Wadena, 32 to 40 inches to sand and gravel	B								
		Jan-Dec	---	---	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
354:									
Aquolls (marsh), ponded---	---								
		January	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		February	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		March	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		April	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		May	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		June	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		July	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		August	0.0-6.0	>6.0	---	---	None	---	None
		September	0.0-6.0	>6.0	---	---	None	---	None
		October	0.0-6.0	>6.0	---	---	None	---	None
		November	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		December	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
375:									
Fostoria, lacustrine substratum---------------	C								
		January	1.0-3.5	>6.0	---	---	None	---	None
		February	1.0-3.5	>6.0	---	---	None	---	None
		March	1.0-3.5	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.0-3.5	>6.0	---	---	None	---	None
		June	1.0-3.5	>6.0	---	---	None	---	None
		July	1.0-3.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	3.5-6.0	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	1.0-3.5	>6.0	---	---	None	---	None
		December	1.0-3.5	>6.0	---	---	None	---	None
376F:									
Cornell-------------------	C								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
379:									
Ocheyedan, lacustrine substratum---------------	C								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
379B:									
Ocheyedan, lacustrine substratum	C								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
379C2:									
Ocheyedan, lacustrine substratum, moderately eroded	C								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
384:									
Collinwood	C								
		January	1.0-3.5	>6.0	---	---	None	---	None
		February	1.0-3.5	>6.0	---	---	None	---	None
		March	1.0-3.5	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.0-3.5	>6.0	---	---	None	---	None
		June	1.0-3.5	>6.0	---	---	None	---	None
		July	1.0-3.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	3.5-6.0	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	1.0-3.5	>6.0	---	---	None	---	None
		December	1.0-3.5	>6.0	---	---	None	---	None
390:									
Waldorf	C/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	---	None
		March	0.0-1.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.0-1.0	>6.0	---	---	None	---	None
		June	0.0-1.0	>6.0	---	---	None	---	None
		July	0.0-1.0	>6.0	---	---	None	---	None
		August	0.0-6.0	>6.0	---	---	None	---	None
		September	0.0-6.0	>6.0	---	---	None	---	None
		October	0.0-6.0	>6.0	---	---	None	---	None
		November	0.0-1.0	>6.0	---	---	None	---	None
		December	0.0-1.0	>6.0	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
397:									
Letri	B/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	---	None
		March	0.0-1.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.0-1.0	>6.0	---	---	None	---	None
		June	0.0-1.0	>6.0	---	---	None	---	None
		July	0.0-1.0	>6.0	---	---	None	---	None
		August	0.0-6.0	>6.0	---	---	None	---	None
		September	0.0-6.0	>6.0	---	---	None	---	None
		October	0.0-6.0	>6.0	---	---	None	---	None
		November	0.0-1.0	>6.0	---	---	None	---	None
		December	0.0-1.0	>6.0	---	---	None	---	None
433E:									
Moneta	B								
		Jan-Dec	---	---	---	---	None	---	None
433F:									
Moneta	B								
		Jan-Dec	---	---	---	---	None	---	None
433G:									
Moneta	B								
		Jan-Dec	---	---	---	---	None	---	None
455:									
Wilmonton	B								
		January	1.0-3.5	>6.0	---	---	None	---	None
		February	1.0-3.5	>6.0	---	---	None	---	None
		March	1.0-3.5	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.0-3.5	>6.0	---	---	None	---	None
		June	1.0-3.5	>6.0	---	---	None	---	None
		July	1.0-3.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	3.5-6.0	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	1.0-3.5	>6.0	---	---	None	---	None
		December	1.0-3.5	>6.0	---	---	None	---	None
456:									
Wilmonton	B								
		January	1.0-3.5	>6.0	---	---	None	---	None
		February	1.0-3.5	>6.0	---	---	None	---	None
		March	1.0-3.5	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.0-3.5	>6.0	---	---	None	---	None
		June	1.0-3.5	>6.0	---	---	None	---	None
		July	1.0-3.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	3.5-6.0	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	1.0-3.5	>6.0	---	---	None	---	None
		December	1.0-3.5	>6.0	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table Upper limit	Water table Lower limit	Ponding Surface water depth	Ponding Duration	Ponding Frequency	Flooding Duration	Flooding Frequency
			Ft	Ft	Ft				
485:									
Spillville	B								
		January	1.0-3.5	>6.0	---	---	None	---	None
		February	1.0-3.5	>6.0	---	---	None	Very brief	Occasional
		March	1.0-3.5	>6.0	---	---	None	Very brief	Occasional
		April	1.0-3.5	>6.0	---	---	None	Very brief	Occasional
		May	1.0-3.5	>6.0	---	---	None	Very brief	Occasional
		June	1.0-3.5	>6.0	---	---	None	Very brief	Occasional
		July	1.0-3.5	>6.0	---	---	None	Very brief	Occasional
		August	3.5-5.0	>6.0	---	---	None	Very brief	Occasional
		September	3.5-5.0	>6.0	---	---	None	Very brief	Occasional
		October	3.5-5.0	>6.0	---	---	None	Very brief	Occasional
		November	1.0-3.5	>6.0	---	---	None	Very brief	Occasional
		December	1.0-3.5	>6.0	---	---	None	---	None
506:									
Wacousta	B/D								
		January	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		February	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		March	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		April	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		May	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		June	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		July	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		August	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		September	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		October	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		November	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		December	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
507:									
Canisteo	B/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	---	None
		March	0.0-1.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.0-1.0	>6.0	---	---	None	---	None
		June	0.0-1.0	>6.0	---	---	None	---	None
		July	0.0-1.0	>6.0	---	---	None	---	None
		August	0.0-6.0	>6.0	---	---	None	---	None
		September	0.0-6.0	>6.0	---	---	None	---	None
		October	0.0-6.0	>6.0	---	---	None	---	None
		November	0.0-1.0	>6.0	---	---	None	---	None
		December	0.0-1.0	>6.0	---	---	None	---	None
541C:									
Estherville	B								
		Jan-Dec	---	---	---	---	None	---	None
Hawick	A								
		Jan-Dec	---	---	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
559:									
Talcot	B/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	---	None
		March	0.0-1.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.0-1.0	>6.0	---	---	None	---	None
		June	0.0-1.0	>6.0	---	---	None	---	None
		July	0.0-1.0	>6.0	---	---	None	---	None
		August	0.0-6.0	>6.0	---	---	None	---	None
		September	0.0-6.0	>6.0	---	---	None	---	None
		October	0.0-6.0	>6.0	---	---	None	---	None
		November	0.0-1.0	>6.0	---	---	None	---	None
		December	0.0-1.0	>6.0	---	---	None	---	None
577B:									
Everly	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
577C2:									
Everly, moderately eroded	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
637D2:									
Everly, moderately eroded	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
Moneta, moderately eroded	B								
		Jan-Dec	---	---	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
638C2:									
Clarion, moderately eroded	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
Storden, moderately eroded	B								
		Jan-Dec	---	---	---	---	None	---	None
672:									
May City------------------	B								
		Jan-Dec	---	---	---	---	None	---	None
672B:									
May City------------------	B								
		Jan-Dec	---	---	---	---	None	---	None
672C2:									
May City, moderately eroded-------------------	B								
		Jan-Dec	---	---	---	---	None	---	None
709:									
Fairhaven-----------------	B								
		Jan-Dec	---	---	---	---	None	---	None
733:									
Calco---------------------	B/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		March	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		April	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		May	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		June	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		July	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		August	0.0-6.0	>6.0	---	---	None	Brief	Occasional
		September	0.0-6.0	>6.0	---	---	None	Brief	Occasional
		October	0.0-6.0	>6.0	---	---	None	Brief	Occasional
		November	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		December	0.0-1.0	>6.0	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
735:									
Havelock------------------	B/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		March	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		April	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		May	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		June	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		July	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		August	0.0-6.0	>6.0	---	---	None	Brief	Occasional
		September	0.0-6.0	>6.0	---	---	None	Brief	Occasional
		October	0.0-6.0	>6.0	---	---	None	Brief	Occasional
		November	0.0-1.0	>6.0	---	---	None	Brief	Occasional
		December	0.0-1.0	>6.0	---	---	None	---	None
740D:									
Hawick--------------------	A								
		Jan-Dec	---	---	---	---	None	---	None
810:									
Galva, terrace------------	B								
		Jan-Dec	---	---	---	---	None	---	None
810B:									
Galva, terrace------------	B								
		Jan-Dec	---	---	---	---	None	---	None
828B:									
Zenor---------------------	B								
		Jan-Dec	---	---	---	---	None	---	None
828C2:									
Zenor, moderately eroded--	B								
		Jan-Dec	---	---	---	---	None	---	None
835D2:									
Storden, moderately eroded	B								
		Jan-Dec	---	---	---	---	None	---	None
Omsrud, moderately eroded	B								
		Jan-Dec	---	---	---	---	None	---	None
835E2:									
Storden, moderately eroded	B								
		Jan-Dec	---	---	---	---	None	---	None
Omsrud, moderately eroded	B								
		Jan-Dec	---	---	---	---	None	---	None
854D:									
Histosols, fens-----------	---								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	---	None
		March	0.0-1.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.0-1.0	>6.0	---	---	None	---	None
		June	0.0-1.0	>6.0	---	---	None	---	None
		July	0.0-1.0	>6.0	---	---	None	---	None
		August	0.0-6.0	>6.0	---	---	None	---	None
		September	0.0-6.0	>6.0	---	---	None	---	None
		October	0.0-6.0	>6.0	---	---	None	---	None
		November	0.0-1.0	>6.0	---	---	None	---	None
		December	0.0-1.0	>6.0	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
874:									
Dickinson, lacustrine substratum	C								
		Jan-Dec	---	---	---	---	None	---	None
874B:									
Dickinson, lacustrine substratum	C								
		Jan-Dec	---	---	---	---	None	---	None
874C2:									
Dickinson, lacustrine substratum, moderately eroded	C								
		Jan-Dec	---	---	---	---	None	---	None
875:									
Roine	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
875B:									
Roine	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
875C2:									
Roine, moderately eroded	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
878:									
Ocheyedan	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
878B:									
Ocheyedan	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
879:									
Fostoria	B								
		January	1.0-3.5	>6.0	---	---	None	---	None
		February	1.0-3.5	>6.0	---	---	None	---	None
		March	1.0-3.5	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.0-3.5	>6.0	---	---	None	---	None
		June	1.0-3.5	>6.0	---	---	None	---	None
		July	1.0-3.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	3.5-6.0	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	1.0-3.5	>6.0	---	---	None	---	None
		December	1.0-3.5	>6.0	---	---	None	---	None
928:									
Annieville	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
928B:									
Annieville	B								
		January	4.0-6.0	>6.0	---	---	None	---	None
		February	4.0-6.0	>6.0	---	---	None	---	None
		March	4.0-6.0	>6.0	---	---	None	---	None
		April	4.0-6.0	>6.0	---	---	None	---	None
		May	4.0-6.0	>6.0	---	---	None	---	None
		June	4.0-6.0	>6.0	---	---	None	---	None
		July	4.0-6.0	>6.0	---	---	None	---	None
		August	6.0	>6.0	---	---	None	---	None
		September	6.0	>6.0	---	---	None	---	None
		October	6.0	>6.0	---	---	None	---	None
		November	4.0-6.0	>6.0	---	---	None	---	None
		December	4.0-6.0	>6.0	---	---	None	---	None
992:									
Gillett Grove	B/D								
		January	0.0-1.0	>6.0	0.0-1.0	Brief	Frequent	---	None
		February	0.0-1.0	>6.0	0.0-1.0	Brief	Frequent	---	None
		March	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		April	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		May	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		June	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		July	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		August	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		September	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		October	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		November	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		December	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
1053:									
Belmann, gypsum phase	C								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	---	None
		March	0.0-1.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.0-1.0	>6.0	---	---	None	---	None
		June	0.0-1.0	>6.0	---	---	None	---	None
		July	0.0-1.0	>6.0	---	---	None	---	None
		August	0.0-6.0	>6.0	---	---	None	---	None
		September	0.0-6.0	>6.0	---	---	None	---	None
		October	0.0-6.0	>6.0	---	---	None	---	None
		November	0.0-1.0	>6.0	---	---	None	---	None
		December	0.0-1.0	>6.0	---	---	None	---	None
1091:									
McCreath	B								
		January	1.0-3.5	>6.0	---	---	None	---	None
		February	1.0-3.5	>6.0	---	---	None	---	None
		March	1.0-3.5	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.0-3.5	>6.0	---	---	None	---	None
		June	1.0-3.5	>6.0	---	---	None	---	None
		July	1.0-3.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	3.5-6.0	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	1.0-3.5	>6.0	---	---	None	---	None
		December	1.0-3.5	>6.0	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
1092:									
Gillett Grove	B/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	---	None
		March	0.0-1.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.0-1.0	>6.0	---	---	None	---	None
		June	0.0-1.0	>6.0	---	---	None	---	None
		July	0.0-1.0	>6.0	---	---	None	---	None
		August	0.0-6.0	>6.0	---	---	None	---	None
		September	0.0-6.0	>6.0	---	---	None	---	None
		October	0.0-6.0	>6.0	---	---	None	---	None
		November	0.0-1.0	>6.0	---	---	None	---	None
		December	0.0-1.0	>6.0	---	---	None	---	None
1133:									
Colo	B/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	Brief	Frequent
		March	0.0-1.0	>6.0	---	---	None	Brief	Frequent
		April	0.0-1.0	>6.0	---	---	None	Brief	Frequent
		May	0.0-1.0	>6.0	---	---	None	Brief	Frequent
		June	0.0-1.0	>6.0	---	---	None	Brief	Frequent
		July	0.0-1.0	>6.0	---	---	None	Brief	Frequent
		August	0.0-6.0	>6.0	---	---	None	Brief	Frequent
		September	0.0-6.0	>6.0	---	---	None	Brief	Frequent
		October	0.0-6.0	>6.0	---	---	None	Brief	Frequent
		November	0.0-1.0	>6.0	---	---	None	Brief	Frequent
		December	0.0-1.0	>6.0	---	---	None	---	None
1259:									
Biscay, depressional	B/D								
		January	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		February	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		March	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		April	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		May	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		June	0.0-1.0	>6.0	0.0-1.0	Long	Frequent	---	None
		July	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		August	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		September	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		October	0.0-6.0	>6.0	0.0-1.0	Brief	Rare	---	None
		November	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
		December	0.0-1.0	>6.0	0.0-1.0	Brief	Occasional	---	None
1385:									
Ocheda	C								
		January	1.0-3.5	>6.0	---	---	None	---	None
		February	1.0-3.5	>6.0	---	---	None	---	None
		March	1.0-3.5	>6.0	---	---	None	---	None
		April	1.0-3.5	>6.0	---	---	None	---	None
		May	1.0-3.5	>6.0	---	---	None	---	None
		June	1.0-3.5	>6.0	---	---	None	---	None
		July	1.0-3.5	>6.0	---	---	None	---	None
		August	3.5-6.0	>6.0	---	---	None	---	None
		September	3.5-6.0	>6.0	---	---	None	---	None
		October	3.5-6.0	>6.0	---	---	None	---	None
		November	1.0-3.5	>6.0	---	---	None	---	None
		December	1.0-3.5	>6.0	---	---	None	---	None

Table 20.--Water Features--Continued

Map symbol and component name	Hydro-logic group	Month	Water table: Upper limit	Water table: Lower limit	Ponding: Surface water depth	Ponding: Duration	Ponding: Frequency	Flooding: Duration	Flooding: Frequency
			Ft	Ft	Ft				
1508:									
Belmann-------------------	C								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	---	None
		March	0.0-1.0	>6.0	---	---	None	---	None
		April	0.0-1.0	>6.0	---	---	None	---	None
		May	0.0-1.0	>6.0	---	---	None	---	None
		June	0.0-1.0	>6.0	---	---	None	---	None
		July	0.0-1.0	>6.0	---	---	None	---	None
		August	0.0-6.0	>6.0	---	---	None	---	None
		September	0.0-6.0	>6.0	---	---	None	---	None
		October	0.0-6.0	>6.0	---	---	None	---	None
		November	0.0-1.0	>6.0	---	---	None	---	None
		December	0.0-1.0	>6.0	---	---	None	---	None
1585:									
Spillville----------------	B								
		January	1.0-3.5	>6.0	---	---	None	---	None
		February	1.0-3.5	>6.0	---	---	None	Very brief	Frequent
		March	1.0-3.5	>6.0	---	---	None	Very brief	Frequent
		April	1.0-3.5	>6.0	---	---	None	Very brief	Frequent
		May	1.0-3.5	>6.0	---	---	None	Very brief	Frequent
		June	1.0-3.5	>6.0	---	---	None	Very brief	Frequent
		July	1.0-3.5	>6.0	---	---	None	Very brief	Frequent
		August	3.5-6.0	>6.0	---	---	None	Very brief	Frequent
		September	3.5-6.0	>6.0	---	---	None	Very brief	Frequent
		October	3.5-6.0	>6.0	---	---	None	Very brief	Frequent
		November	1.0-3.5	>6.0	---	---	None	Very brief	Frequent
		December	1.0-3.5	>6.0	---	---	None	---	None
Coland--------------------	B/D								
		January	0.0-1.0	>6.0	---	---	None	---	None
		February	0.0-1.0	>6.0	---	---	None	Very brief	Frequent
		March	0.0-1.0	>6.0	---	---	None	Very brief	Frequent
		April	0.0-1.0	>6.0	---	---	None	Very brief	Frequent
		May	0.0-1.0	>6.0	---	---	None	Very brief	Frequent
		June	0.0-1.0	>6.0	---	---	None	Very brief	Frequent
		July	0.0-1.0	>6.0	---	---	None	Very brief	Frequent
		August	0.0-6.0	>6.0	---	---	None	Very brief	Frequent
		September	0.0-6.0	>6.0	---	---	None	Very brief	Frequent
		October	0.0-6.0	>6.0	---	---	None	Very brief	Frequent
		November	0.0-1.0	>6.0	---	---	None	Very brief	Frequent
		December	0.0-1.0	>6.0	---	---	None	---	None
5010.									
Pits, sand and gravel									
5040.									
Udorthents, loamy									
5060.									
Pits, clay									
AW.									
Animal waste									
SL.									
Sewage lagoon									
W.									
Water									

Table 21.--Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and component name	Subsidence		Potential for frost action	Risk of corrosion	
	Initial	Total		Uncoated steel	Concrete
	In	In			
6:					
Okoboji	---	---	High	High	Low.
27B:					
Terril	---	---	Moderate	Moderate	Low.
27C:					
Terril	---	---	Moderate	Moderate	Low.
27D:					
Terril	---	---	Moderate	Moderate	Low.
31:					
Afton	---	---	High	High	Low.
34B:					
Estherville	---	---	Low	Low	Low.
41C:					
Sparta	---	---	Low	Low	Moderate.
48:					
Knoke	---	---	High	High	Low.
54:					
Zook	---	---	High	High	Moderate.
55:					
Nicollet	---	---	High	High	Low.
62F:					
Storden	---	---	Moderate	Low	Low.
77B:					
Sac	---	---	High	Moderate	Low.
77C:					
Sac	---	---	High	Moderate	Low.
77C2:					
Sac, moderately eroded	---	---	High	Moderate	Low.
90:					
Okoboji mucky silty clay loam	---	---	High	High	Low.
95:					
Harps	---	---	High	High	Low.
107:					
Webster	---	---	High	High	Low.
108:					
Wadena	---	---	Low	Low	Low.
108B:					
Wadena	---	---	Low	Low	Low.

Table 21.--Soil Features--Continued

Map symbol and component name	Subsidence: Initial	Subsidence: Total	Potential for frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In	In			
133:					
Colo	---	---	High	High	Moderate.
135:					
Coland	---	---	High	High	Low.
138B:					
Clarion	---	---	Moderate	Low	Low.
138C2:					
Clarion, moderately eroded	---	---	Moderate	Low	Low.
175:					
Dickinson	---	---	Moderate	Low	Moderate.
175B:					
Dickinson	---	---	Moderate	Low	Moderate.
191:					
Rushmore	---	---	High	High	Low.
201B:					
Coland	---	---	High	High	Low.
Terril	---	---	Moderate	Moderate	Low.
202:					
Cylinder, 24 to 32 inches to sand and gravel	---	---	High	Moderate	Low.
203:					
Cylinder, 32 to 40 inches to sand and gravel	---	---	High	Moderate	Low.
221:					
Klossner	2-4	25-32	High	High	Moderate.
259:					
Biscay	---	---	High	Moderate	Low.
274:					
Rolfe	---	---	High	High	Moderate.
282:					
Ransom	---	---	High	High	Low.
308:					
Wadena, 32 to 40 inches to sand and gravel	---	---	Low	Low	Low.
308B:					
Wadena, 32 to 40 inches to sand and gravel	---	---	Low	Low	Low.
354.					
Aquolls (marsh), ponded					

Table 21.--Soil Features--Continued

Map symbol and component name	Subsidence: Initial	Subsidence: Total	Potential for frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In	In			
375:					
Fostoria, lacustrine substratum	---	---	High	High	Low.
376F:					
Cornell	---	---	Moderate	Moderate	Moderate.
379:					
Ocheyedan, lacustrine substratum	---	---	High	High	Low.
379B:					
Ocheyedan, lacustrine substratum	---	---	High	High	Low.
379C2:					
Ocheyedan, lacustrine substratum, moderately eroded	---	---	High	High	Low.
384:					
Collinwood	---	---	High	High	Low.
390:					
Waldorf	---	---	High	High	Low.
397:					
Letri	---	---	High	High	Low.
433E:					
Moneta	---	---	Moderate	Low	Low.
433F:					
Moneta	---	---	Moderate	Low	Low.
433G:					
Moneta	---	---	Moderate	Low	Low.
455:					
Wilmonton	---	---	High	Moderate	Low.
456:					
Wilmonton	---	---	High	Moderate	Low.
485:					
Spillville	---	---	Moderate	High	Moderate.
506:					
Wacousta	---	---	High	High	Low.
507:					
Canisteo	---	---	High	High	Low.
541C:					
Estherville	---	---	Low	Low	Low.
Hawick	---	---	Low	Low	Low.

Table 21.--Soil Features--Continued

Map symbol and component name	Subsidence: Initial	Subsidence: Total	Potential for frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In	In			
559:					
Talcot	---	---	High	High	Low.
577B:					
Everly	---	---	Moderate	Moderate	Moderate.
577C2:					
Everly, moderately eroded	---	---	Moderate	Moderate	Moderate.
637D2:					
Everly, moderately eroded	---	---	Moderate	Moderate	Moderate.
Moneta, moderately eroded	---	---	Moderate	Moderate	Moderate.
638C2:					
Clarion, moderately eroded	---	---	Moderate	Low	Low.
Storden, moderately eroded	---	---	Moderate	Low	Low.
672:					
May City	---	---	Low	Low	High.
672B:					
May City	---	---	Low	Low	High.
672C2:					
May City, moderately eroded	---	---	Low	Low	High.
709:					
Fairhaven	---	---	Moderate	Low	Moderate.
733:					
Calco	---	---	High	High	Low.
735:					
Havelock	---	---	High	High	Low.
740D:					
Hawick	---	---	Low	Low	Low.
810:					
Galva, terrace	---	---	High	Moderate	Moderate.
810B:					
Galva, terrace	---	---	High	Moderate	Moderate.
828B:					
Zenor	---	---	Low	Low	Low.
828C2:					
Zenor, moderately eroded	---	---	Low	Low	Low.
835D2:					
Storden, moderately eroded	---	---	Moderate	Low	Low.

Table 21.--Soil Features--Continued

Map symbol and component name	Subsidence		Potential for frost action	Risk of corrosion	
	Initial	Total		Uncoated steel	Concrete
	In	In			
835D2:					
Omsrud, moderately eroded	---	---	Moderate	Low	Low.
835E2:					
Storden, moderately eroded	---	---	Moderate	Low	Low.
Omsrud, moderately eroded	---	---	Moderate	Low	Low.
854D.					
Histosols, fens					
874:					
Dickinson, lacustrine substratum	---	---	High	High	Low.
874B:					
Dickinson, lacustrine substratum	---	---	High	High	Low.
874C2:					
Dickinson, lacustrine substratum, moderately eroded	---	---	High	High	Low.
875:					
Roine	---	---	Moderate	Low	Moderate.
875B:					
Roine	---	---	Moderate	Low	Moderate.
875C2:					
Roine, moderately eroded	---	---	Moderate	Low	Moderate.
878:					
Ocheyedan	---	---	Moderate	Low	Low.
878B:					
Ocheyedan	---	---	Moderate	Low	Low.
879:					
Fostoria	---	---	High	High	Low.
928:					
Annieville	---	---	High	Moderate	Moderate.
928B:					
Annieville	---	---	High	Moderate	Moderate.
992:					
Gillett Grove	---	---	High	High	Low.
1053:					
Belmann, gypsum phase	---	---	High	High	High.

Table 21.--Soil Features--Continued

Map symbol and component name	Subsidence: Initial	Subsidence: Total	Potential for frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In	In			
1091:					
McCreath	---	---	High	Moderate	Moderate.
1092:					
Gillett Grove	---	---	High	High	Low.
1133:					
Colo	---	---	High	High	Low.
1259:					
Biscay, depressional	---	---	High	Moderate	Low.
1385:					
Ocheda	---	---	High	High	Low.
1508:					
Belmann	---	---	High	High	Low.
1585:					
Spillville	---	---	Moderate	High	Moderate.
Coland	---	---	High	High	Low.
5010.					
Pits, sand and gravel					
5040.					
Udorthents, loamy					
5060.					
Pits, clay					
AW.					
Animal waste					
SL.					
Sewage lagoon					
W.					
Water					

Table 22.--Classification of the Soils

(An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series)

Soil name	Family or higher taxonomic class
Afton	Fine-silty, mixed, superactive, mesic Cumulic Endoaquolls
Annieville	Fine-silty, mixed, superactive, mesic Typic Hapludolls
Belmann	Fine, smectitic, mesic Vertic Endoaquolls
Biscay	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Endoaquolls
Calco	Fine-silty, mixed, superactive, calcareous, mesic Cumulic Endoaquolls
Calcousta	Fine-silty, mixed, superactive, calcareous, mesic Typic Endoaquolls
Canisteo	Fine-loamy, mixed, superactive, calcareous, mesic Typic Endoaquolls
Clarion	Fine-loamy, mixed, superactive, mesic Typic Hapludolls
*Clarion	Fine-loamy, mixed, superactive, mesic Typic Eutrudepts
Coland	Fine-loamy, mixed, superactive, mesic Cumulic Endoaquolls
Collinwood	Fine, smectitic, mesic Aquertic Hapludolls
Colo	Fine-silty, mixed, superactive, mesic Cumulic Endoaquolls
Cornell	Fine, smectitic, mesic Oxyaquic Vertic Argiudolls
Crippin	Fine-loamy, mixed, superactive, mesic Aquic Hapludolls
Cylinder	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Aquic Hapludolls
Dickinson	Coarse-loamy, mixed, superactive, mesic Typic Hapludolls
*Dickinson	Coarse-loamy, mixed, superactive, mesic Typic Eutrudepts
Dickman	Sandy, mixed, mesic Typic Hapludolls
Estherville	Sandy, mixed, mesic Typic Hapludolls
*Estherville	Sandy, mixed, mesic Typic Eutrudepts
Everly	Fine-loamy, mixed, superactive, mesic Typic Hapludolls
*Everly	Fine-loamy, mixed, superactive, mesic Typic Eutrudepts
Fairhaven	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Hapludolls
Fostoria	Fine-loamy, mixed, superactive, mesic Aquic Hapludolls
Galva	Fine-silty, mixed, superactive, mesic Typic Hapludolls
Gillett Grove	Fine-silty, mixed, superactive, mesic Typic Endoaquolls
Guckeen	Fine, smectitic, mesic Aquertic Hapludolls
Hanlon	Coarse-loamy, mixed, superactive, mesic Cumulic Hapludolls
Harps	Fine-loamy, mixed, superactive, mesic Typic Calciaquolls
Havelock	Fine-loamy, mixed, superactive, calcareous, mesic Cumulic Endoaquolls
Hawick	Sandy, mixed, mesic Entic Hapludolls
*Hawick	Mixed, mesic Typic Udipsamments
Klossner	Loamy, mixed, euic, mesic Terric Medisaprists
Knoke	Fine, smectitic, calcareous, mesic Vertic Endoaquolls
Letri	Fine-loamy, mixed, superactive, mesic Typic Endoaquolls
May City	Loamy-skeletal, mixed, superactive, mesic Typic Hapludolls
*May City	Loamy-skeletal, mixed, superactive, mesic Typic Eutrudepts
McCreath	Fine-silty, mixed, superactive, mesic Aquic Hapludolls
Moneta	Fine-loamy, mixed, superactive, mesic Entic Hapludolls
Nicollet	Fine-loamy, mixed, superactive, mesic Aquic Hapludolls
Ocheda	Fine, smectitic, mesic Aquertic Hapludolls
Ocheyedan	Fine-loamy, mixed, superactive, mesic Typic Hapludolls
*Ocheyedan	Fine-loamy, mixed, superactive, mesic Typic Eutrudepts
Okoboji	Fine, smectitic, mesic Cumulic Vertic Endoaquolls
*Omsrud	Fine-loamy, mixed, superactive, mesic Typic Eutrudepts
Primghar	Fine-silty, mixed, superactive, mesic Aquic Hapludolls
Ransom	Fine-silty, mixed, superactive, mesic Aquic Hapludolls
Ridgeport	Coarse-loamy, mixed, superactive, mesic Typic Hapludolls
Roine	Coarse-loamy, mixed, superactive, mesic Typic Hapludolls
*Roine	Loamy-skeletal, mixed, mesic Typic Eutrudepts
Rolfe	Fine, smectitic, mesic Typic Argialbolls
Rushmore	Fine-silty, mixed, superactive, mesic Typic Endoaquolls
Sac	Fine-silty, mixed, superactive, mesic Oxyaquic Hapludolls
*Sac	Fine-loamy, mixed, superactive, mesic Typic Eutrudepts

Table 22.--Classification of the Soils--Continued

Soil name	Family or higher taxonomic class
Shandep	Fine-loamy, mixed, superactive, mesic Cumulic Endoaquolls
Sparta	Sandy, mixed, mesic Entic Hapludolls
Spillville	Fine-loamy, mixed, superactive, mesic Cumulic Hapludolls
Storden	Fine-loamy, mixed, superactive, mesic Typic Eutrudepts
Sunburg	Coarse-loamy, mixed, superactive, mesic Typic Eutrudepts
Talcot	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, mesic Typic Endoaquolls
Terril	Fine-loamy, mixed, superactive, mesic Cumulic Hapludolls
Wacousta	Fine-silty, mixed, superactive, mesic Typic Endoaquolls
Wadena	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Hapludolls
Waldorf	Fine, smectitic, mesic Vertic Epiaquolls
Webster	Fine-loamy, mixed, superactive, mesic Typic Endoaquolls
Wilmonton	Fine-loamy, mixed, superactive, mesic Aquic Hapludolls
Zenor	Coarse-loamy, mixed, superactive, mesic Typic Hapludolls
*Zenor	Coarse-loamy, mixed, superactive, mesic Typic Eutrudepts
Zook	Fine, smectitic, mesic Cumulic Vertic Endoaquolls