United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
the Minnesota Agricultural
Experiment Station

Soil Survey of Otter Tail County, Minnesota

How to Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the general soil map units, detailed soil map units, and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

On the **general soil map**, the survey area is 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** in Part I of this survey for a general description of the soils in your area.

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 **Index to Map Units** in Part I of this survey, 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** in Part I and Part II for other 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 November 1994. Soil names and descriptions were approved in 1995. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1994. This survey was made cooperatively by the Natural Resources Conservation Service and the Minnesota Agricultural Experiment Station. It is part of the technical assistance furnished to the Otter Tail County Soil and Water Conservation Districts. Other assistance was provided by the Agricultural Extension Service, the Minnesota Department of Natural Resources, and the Board of Water and Soil Resources. The survey was partially funded by the Legislative Commission for Minnesota Resources and by Otter Tail County.

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.

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Cover: *Upper left corner*—An area of the Snellman-Naytahwaush-Lida association. Most areas are used as woodland or pasture; the less sloping areas are used for crops. Controlling water erosion and maintaining water quality are the most critical concerns in this association. *Upper right corner*—An area of the Chapett-Sisseton-Friberg association. Cropland is the dominant land use in this area. *Lower right corner*—An area of the Blowers-Paddock-Cathro association. Most areas are used for forage crops or corn for the dairy operations in this part of the county. Because of the large number of stones in this association, rock removal is an important element in the management of the soils. *Lower left corner*—An area of the Kandota-Knute-Brandsvold association. Most areas are used for forage crops or corn for the dairy operations in this part of the county.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is http://www.nrcs.usda.gov (click on "Technical Resources").

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Foreword

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

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

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

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

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State Conservationist
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Soil Survey of
Otter Tail County, Minnesota

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

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 or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, soil scientists develop a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate 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 relationships, 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 Nature of the Survey Area

Otter Tail County is in west-central Minnesota (fig. 1). It has a total area of about 2,232 square miles, or about 1,423,300 acres. The total land area is about 1,190,100 acres. The total area of water in the county is about 233,200 acres (USDA, 1984). Fergus Falls, the county seat, is in the southwestern part of the county. In 1990, the population of Otter Tail County was 50,714.

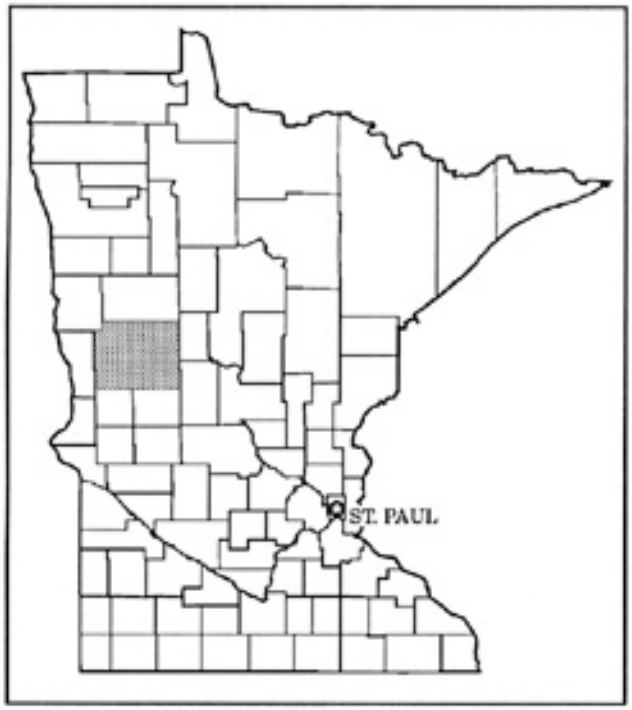


Figure 1.—Location of Otter Tail County in Minnesota.

The agricultural enterprises in the county are mainly dairy farming, cash crops, and livestock and poultry operations. A significant part of the county's economy involves tourism, sport fishing, and recreational uses associated with the many lakes and rivers. Most of the light industrial products manufactured in the county are related to agriculture or recreation.

Some forest management and harvesting produces saw logs, pulpwood, and Christmas trees.

This survey updates an incomplete farm tract soil mapping project for Otter Tail County. It includes mapping of previously unmapped areas and updates the interpretations for the soil types in the county.

Soil scientists were denied access to a few tracts in the county. These areas are indicated by a dashed line around the tract. Soil scientists mapped these areas using knowledge from the surrounding areas, older soil maps, and photo interpretation of aerial photographs. The descriptions and map unit delineations of the soils on these tracts may be less accurate than those in areas where the soil scientists had access and could carefully examine the soils.

History and Settlement

Native Americans used the survey area for hunting and fishing and had permanent dwelling sites. Two Native American tribes were in constant conflict. The Dakota (Sioux) were being pushed from their home area by the Ojibwa (Chippewa) during the late 1700's and early 1800's. Burial mounds and artifacts can still be found. Some of the oldest remains of Native Americans were found near Pelican Rapids, Minnesota. The remains, nicknamed Minnesota Girl, were dated at about 11,000 B.C. (Otter Tail County Historical Museum).

The first white men to enter the county were French and British fur traders. Efforts were made to set up trading posts on the Leaf Lakes and Otter Tail Lake. In the late 1800's, most of the towns were built along the railroad lines. Lumber and agriculture were the major industries in the county at that time. The pine and hardwood forests, transportation system, and markets were instrumental in the development of Fergus Falls into a lumber center.

In 1870, the population of the county was about 2,000. At that time the principal languages spoken in the county were Norwegian, Swedish, German, and English (Mason, 1916).

Otter Tail County was established in March 1858 by a legislative act. It was organized in 1868. The original county seat was Otter Tail City. The people of Fergus Falls organized a new county named Holcomb. In 1872, a legislative act abolished Holcomb County, added additional townships to the west, and established Fergus Falls as the county seat of Otter Tail County. There are 62 townships in the county. The county is named for Otter Tail Lake and the Otter Tail River.

Farming

At the time of its early settlement, about two-thirds of the survey area was forested and one-third was native prairie. Today, about 20 percent of the county is forested and 80 percent is used as cropland or pastureland. In the early years, wheat was the dominant crop grown. At several times throughout Otter Tail County's farming history, the grasshopper infestations were so terrible that bounties on grasshoppers were enacted. The production of corn and other crops did not begin until about 1905.

The Food Security Act of 1985 included the Conservation Reserve Program. This program involved taking selected cropland acres out of commodity crop production for 10 years and planting those areas to trees or other vegetative cover for the purpose of controlling erosion. From October 1985 to the present, Otter Tail County has had approximately 80,000 acres in the Conservation Reserve Program. Former cropland could be brought back into crop production starting in October 1995, as the Conservation Reserve Program contracts started to expire.

Otter Tail County holds an impressive agricultural standing in Minnesota. In 1994, the county ranked first in production of hay, oats, and dry edible beans and ranked second in stock sheep and lambs, milk cows and milk production, cattle and calves, and total livestock in the State of Minnesota. It ranked third in overall cash receipts. In 1994, there were about 2,950 farms in Otter Tail County and the average farm size was about 335 acres. Approximately 550,000 acres in the county is used for the production of crops. During the 1994 growing season, 148,100 acres was planted to corn for grain; 37,700 acres was used for corn silage; 130,600 acres was used for hay, of which 107,300 acres was alfalfa hay; 45,100 acres was used for oats; 62,500 acres was used for spring wheat; 72,700 acres was used for soybeans; 20,100 acres was used for barley; 14,900 acres was used for dry edible beans; 11,500 acres was used for sunflowers; and 2,600 acres was used for sugarbeets. Minor acreages of other crops included potatoes, buckwheat, and rye (USDA and others, 1995).

Transportation Facilities and Markets

Some present-day highways, roads, and railroad grades follow the old trails and oxen-cart paths made by Native Americans and the first white settlers that traveled through Otter Tail County. Interstate 94 from St. Cloud closely follows an old oxen-cart trail that connected with the old Red River Trail. State and Federal highways include Interstate 94, U.S. Highways 10 and 59, and Minnesota Highways 210, 108, 29, and 78. Interstate 94 crosses the southwest corner of the county and serves Fergus Falls. U.S. Highway 10 crosses the northeast corner of the county and passes through the cities of Bluffton, New York Mills, and Perham. U.S. Highway 59 is a north-south route through Fergus Falls that heads north to Canada. Minnesota Highway 210 crosses from east to west across the southern half of the county and serves the communities of Fergus Falls, Battle Lake, and Henning. Minnesota Highway 29 extends from the city of Wadena south through Parkers Prairie into Douglas County. Minnesota Highway 78 extends south from Perham through the central part of the county to Battle Lake and continues south to Douglas County.

Minnesota Highway 108 heads west from Perham and connects with Interstate 94.

Three railway systems serve the county. One crosses the northeastern part of the county through Perham en route to the west coast; one crosses the southeastern part of the county and serves Fergus Falls; and the third crosses the central part of the county as it heads to the Canadian border.

Grain elevators are located in cities and towns throughout the county. Grain crops are marketed mainly in Fargo, North Dakota, and in Minneapolis, St. Paul, and Duluth, Minnesota. There is a sugarbeet processing plant in Wahpeton, North Dakota.

Livestock are marketed locally in the county at Fergus Falls and Perham, or they are marketed at West Fargo, North Dakota; Sisseton, South Dakota; or South St. Paul, Minnesota. A turkey processing plant is located at Pelican Rapids. A cheese processing plant and other food processing plants are in Perham.

There are six airports in the county. The Battle Lake, Henning, New York Mills, and Pelican Rapids airports have grassed runways. The airports in the cities of Fergus Falls and Perham have paved runways.

Physiography, Relief, and Drainage

Inspiration Peak, the highest elevation in Otter Tail County, is approximately 1,720 feet above sea level. It is on the Alexandria Moraine Complex in the southeastern part of the county, west of Urbank. The lowest point in the county is at an elevation of approximately 1,010 feet above sea level where the Otter Tail River exits the southwest corner of the county.

The county can be divided into five broadly defined landform regions. These are the stagnation moraines, till plains, Wadena Drumlin Field, pitted outwash plains, and Glacial Lake Agassiz Lake Plain. The location of these landform areas within the county is illustrated in figure 2.

The areas of stagnation moraine are comprised of geomorphic regions of the Alexandria Moraine Complex and Big Stone Moraine Complex, which make up about 35 percent of the county. The topography of the stagnation moraine associated with the Alexandria Moraine Complex has high relief with differences in elevation ranging from 10 to 120 feet. The area is gently undulating to steep and is characterized by wet depressions, marshes, and numerous small to large lakes. The stagnation moraine associated with the Big Stone Moraine Complex has undulating to hilly topography with lower relief. The differences in elevation commonly range from 10 to 50 feet. This moraine has wet depressions, marshes, and a few small lakes. Attempts have been made to drain the wet depressions within the moraines, but the complex landscape and a lack of drainage outlets have hindered these practices.

In the northeastern part of the county is the Wadena Drumlin Field, which makes up about 6 percent of the county. The topography is dominated by gently sloping to strongly sloping landscapes of moderate relief. The local relief generally ranges from a few feet to about 30 feet. Many of the depressions between the drumlins are commonly drained by shallow drainageways or deeper drainage ditches. The ditches and drainageways remove the excess surface water.

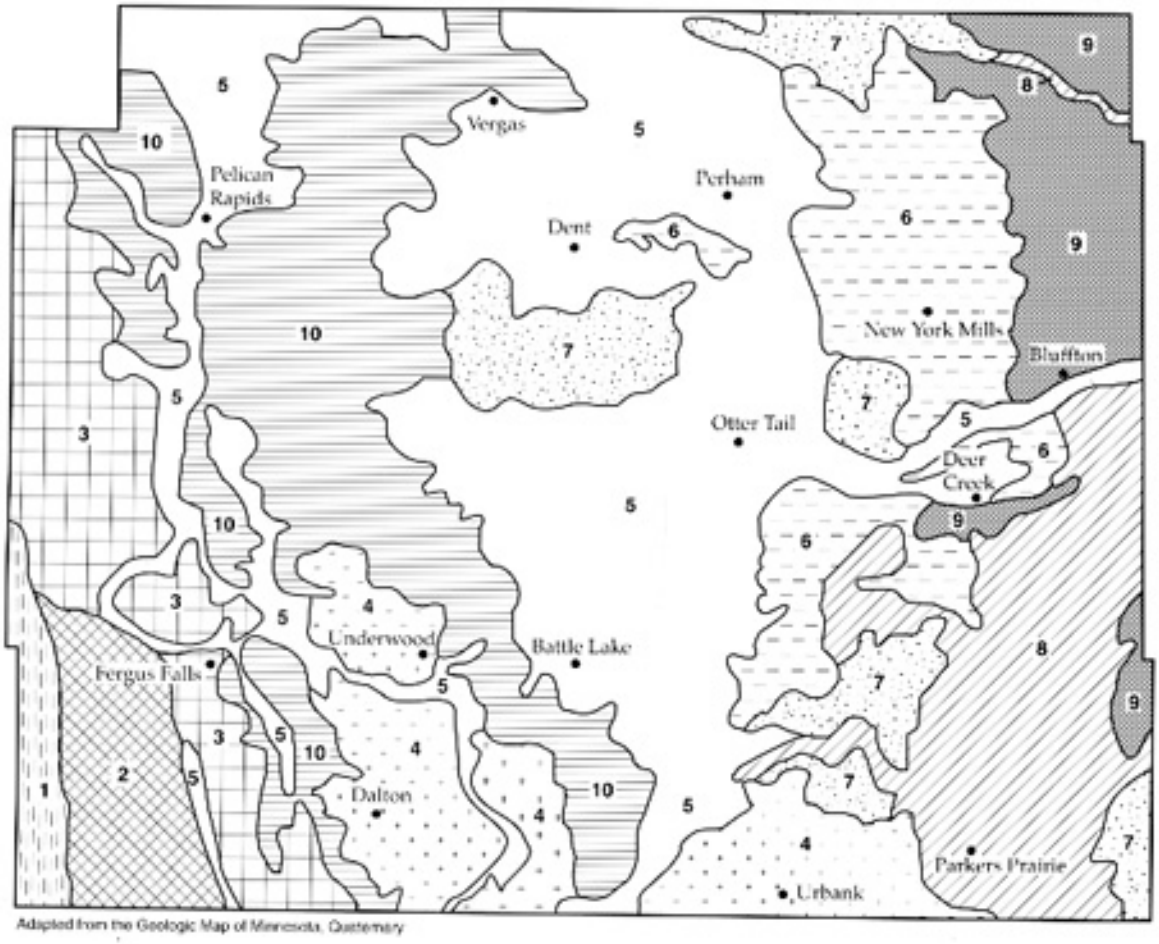
The Henning and Fergus Falls till plains make up 18 percent of the county. The topography is dominated by nearly level to hilly landscapes with short slopes. These areas have moderate relief with differences in elevation commonly ranging from 5 to 50 feet.

The Detroit Lakes Pitted Outwash Plain in the central part of the county and along the meltwater channel of the Pelican River and the Park Rapids-Staples Outwash Plain in the southeast corner of the county make up 40 percent of the county. The topography of the outwash plain areas is nearly level to hilly and has low or moderate relief. The differences in elevation typically range from a few feet to about 40 feet. The Detroit Lakes Pitted Outwash Plain commonly has small to large lakes and small wet depressions. The Park Rapids-Staples Outwash Plain has less relief. It has fewer lakes than other areas but contains more and larger wet depressions, which result from the shallower surficial ground-water table. Many of the large depressions have been drained by ditches that outlet into tributaries of the Leaf River or the Wing River.

The Glacial Lake Agassiz Lake Plain in the southwest corner of the county makes up approximately 1 percent of the county. The area typically is flat or nearly level but ranges to gently sloping in the vicinities of the glacial beach ridges. This area contains a few drainage ditches, and almost all of the soils have some form of surface drainage. The area also has some small and medium depressions.

The continental divide that separates north-flowing waters from south-flowing waters lies in an irregular line near Butler to New York Mills, then south towards Urbank, northwest towards Underwood, and finally south to just west of Dalton. North-flowing waters drain via the Red River into the Hudson Bay, and south-flowing waters drain via the Crow Wing and Minnesota Rivers into the Mississippi River.

Nearly 60 percent of the surface water in Otter Tail



Legend

Deposits Associated with the Des Moines Lobe

Landform		Geomorphic Region
1	Lake Plain	Lake Agassiz
2	Till Plain	Fergus Falls Till Plain
3	Stagnation Moraine	Big Stone Moraine
4	Stagnation Moraine	Altamont Moraine included with the Alexandria Moraine Complex
5	Pitted Outwash Plain	Detroit Lakes Pitted Outwash Plain

Deposits Associated with the Wadena Lobe

Landform		Geomorphic Region
6	Till Plain	Henning Till Plain
7	Stagnation Moraine	Included with the Henning Till Plain
8	Pitted Outwash Plain	Park Rapids-Staples Outwash Plain
9	Drumlin Field	Wadena Drumlin Field
10	Stagnation Moraine	Alexandria Moraine Complex

Figure 2.—Geomorphology and parent material of Otter Tail County.

County flows south and west into the Otter Tail River. The Otter Tail River enters the county from Becker County just south of the city of Frazee. A chain of lakes, including Little Pine Lake, Big Pine Lake, Otter Tail Lake, Rush Lake, and Lost Lake, are connected by the Otter Tail River. The river contains a number of low head dams that maintain water levels and control flooding. The Otter Tail River flows through Fergus Falls and enters the Glacial Lake Agassiz basin near the Orwell Reservoir. It then flows west through Wilkin

County into the Red River. The Toad River drains to the south from Becker County and empties into Big Pine Lake. The Dead River drains Dead Lake towards Otter Tail Lake. The Pelican River drains to the south from Prairie Lake through Pelican Rapids and enters the Otter Tail River west of Fergus Falls. The Pomme de Terre River in the southwestern part of the county is a tributary of the Minnesota River. It flows west from Stalker Lake and then drains into Ten Mile Lake and south into Grant County. The Wing River drains the southeastern part of the county, the Leaf River drains the east-central part, and the Redeye River drains the northeastern part. These rivers and their tributaries flow eastward into the Crow Wing River and the Mississippi River.

Geologic History and Geomorphology

Continental glaciation formed the landscapes of Otter Tail County. Bedrock in Otter Tail County is covered by 200 to more than 400 feet of Wisconsin glacial deposits. Glaciers moving as lobate rivers of ice advanced across the survey area many times and from several different directions. The present landscapes of Otter Tail County began to take shape during the early and middle parts of the Wisconsin Glaciation. The geomorphic landforms in Otter Tail County are drumlin fields, stagnation moraines, till plains, pitted outwash plains, kame moraines, and glacial lake plains (Hobbs and Goebel, 1982).

The Wadena Drumlin Field fans out across Wadena, Todd, Cass, Hubbard, Becker, and Otter Tail Counties of Minnesota. This geomorphic area represents the oldest landscape in Otter Tail County. Radiocarbon dating of organic silts and lake sediments suggests that the drumlins are about 30,000 to 60,000 years old (Wright, 1972). In Otter Tail County, the drumlins are in the northeast corner and near the Todd and Wadena County lines south of the Leaf River. The Wadena Drumlin Field consists of a series of low, smooth, elongated oval hills and broad, nearly level depressions that are oriented from east to west.

The fanlike shape of the drumlin field suggests that ice moved from the northeast. There are two main theories regarding the formation of the drumlins. Studies of pebble lithology and carbonate content suggest that glacial till moved southeastward from the Winnipeg Lowlands into northern Minnesota. This movement was diverted by another glacial lobe advancing from the east (Wright, 1962). A more recent study, however, suggests that pre-late Wisconsin glacial ice that advanced from the Keewatin ice center that is now called the Winnipeg Lobe (formerly identified as the Wadena Lobe) was laid down before the drumlins by an older Rainy Lobe source from the northeast. Thus the Wadena Drumlin Field resulted from a progressive mixing of glacial till from a northeastern source, and ice lobes and flows molded the drumlins (Goldstein, 1985).

When the Wadena or Winnipeg Lobe advanced from the east and northeast across the county, it formed the core of the Alexandria Moraine and the Wadena Drumlin Field. Later readvances of the Wadena Lobe occurred about 20,000 years ago. The coarse-loamy till of the Wadena or Winnipeg Lobe is characterized by less than 18 percent clay and more than 50 percent sand (Anderson, 1976).

The Alexandria Moraine Complex consists of stagnation moraines. These stagnation moraines formed at the outer edges of a glacial lobe. There are also some smaller areas of stagnation moraine in the eastern half of the county. Stagnation moraine landscapes have a complicated pattern of soil materials. Although they are mostly made up of glacial till, some are local deposits of outwash and water-laid sediments. The moraines are typically the highest in elevation, have the greatest relief, and are commonly hilly. There are many small to large ice-block basins in stagnation moraines that now contain lakes or marshes. Ice-walled lakes formed when pits in the stagnant ice on the Alexandria Moraine filled with water-laid sediments. Later, as the ice melted, the surrounding landscape collapsed and the lake bottom became what is now the hilltop (Clayton and Cherry, 1967).

The stagnation moraines in Otter Tail County were formed by ice advances from both the Wadena or Winnipeg Lobe and the Des Moines Lobe.

The Altamont Moraine in Otter Tail County is the portion of the Alexandria Moraine that was overridden by the Des Moines Lobe glacial drift.

About 14,000 years ago, the Des Moines Lobe advanced to the south across Manitoba, where it incorporated limestone rocks. As the glacial lobe moved south along the Red River Lowland, shale-rich materials derived from Cretaceous rock were mixed into the till fabric (Sackreiter, 1975). The Des Moines Lobe continued to spread east into Otter Tail County onto the Alexandria Moraine and southeast along the moraine. Before it retreated, the Des Moines Lobe left behind the Big Stone Moraine, which is also referred to as the Fergus Falls Till Plain (University of Minnesota, 1969). The fine-loamy till of the Des Moines Lobe is characterized by more than 18 percent clay, typically less than 50 percent sand, and a high content of shale.

The Henning Till Plain was formed behind the

advancing front of the glacial ice of the Wadena or Winnipeg Lobe and the Des Moines Lobe. The till plain has generally low or moderate relief and is typically gently undulating. In places, especially south and west of New York Mills, the till was deposited over older outwash deposits. Thus, in some areas on the Henning Till Plain, the till ranges from about 3 feet to more than 10 feet thick over outwash. Also on the till plain, glacial meltwaters flowing under the ice of the Wadena Lobe formed a few eskers.

The large volumes of meltwater pouring east and south off the Wadena and Des Moines Lobes left extensive outwash plains. This outwash area formed the Detroit Lakes Pitted Outwash Plain in the central part of the county. Pitted outwash plains are characterized by many small to large ice-block basins that now contain lakes or marshes. The areas of the Detroit Lakes Pitted Outwash Plain adjacent to the Alexandria Moraine are described as kame moraines in the county. The landforms and topography of the kame moraine are similar to those of the stagnation moraine, except that the parent material is outwash.

Meltwater sediments flowing eastward from the Henning Till Plain and southward from the Itasca Moraine Complex formed the Park Rapids-Staples Outwash Plain. The Redeye and Leaf Rivers were major meltwater channels flowing eastward. Water flowage was blocked in an area near Pillager, resulting in the formation of Glacial Lake Wadena. Meltwater and sediment were redirected along a meltwater channel toward Parkers Prairie. Eventually the blockage at the Pillager gap was broken, and meltwaters from the Des Moines and Wadena Lobes exited eastward through the gap into the Crow Wing River.

About 9,000 to 12,000 years ago, tremendous volumes of meltwater accumulated to form Glacial Lake Agassiz. Lake Agassiz was more than 360 feet deep and covered more than 120,000 square miles in Minnesota, North Dakota, and Canada. It was formed when the normal northward flow of water in the Red River Valley was blocked by the Des Moines glacial ice lobe. As water levels rose higher, Glacial Lake Agassiz developed an outlet to the south near Browns Valley. A succession of beach ridges formed, marking stable lake levels. The Herman Beach marks the highest stable level of Lake Agassiz. It runs along the eastern edge of the Lake Agassiz Plain in Otter Tail County. When the Des Moines glacial lobe retreated, the water in the Red River Valley could once again flow north and Lake Agassiz drained away (Elson, 1967).

The most recent deposits in the survey area are not glacial in origin. They consist of alluvial sediments on flood plains and lakeshores. Organic material and limnic sediments in lakes and depressions are estimated to have accumulated about 4,000 to 5,000 years ago (Norton, 1982).

Climate

The three tables at the end of this section provide climate data for the survey area as recorded at Ottertail and Fergus Falls in the period 1961 to 1990.

In winter, the average temperature at Ottertail and Fergus Falls is 11 degrees F. The average daily minimum temperature is 0 degrees at Ottertail and 1 degree at Fergus Falls. The lowest temperature on record at Ottertail, which occurred on February 3, 1982, is -41 degrees. The lowest temperature on record at Fergus Falls, which occurred on February 5, 1982, is -40 degrees. In summer, the average temperature is 69 degrees at Ottertail and 68 degrees at Fergus Falls. The average daily maximum temperature is 80 degrees at both recording stations. The highest temperature at Ottertail, which occurred on July 27, 1988, is 102 degrees. The highest temperature at Fergus Falls, which occurred on August 16, 1988, also is 102 degrees.

Growing degree days 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 (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation at Ottertail is 26.56 inches. Of this, 19.45 inches, or about 73 percent, usually falls in April through September. The total annual precipitation at Fergus Falls is 23.25 inches. Of this, 17.46 inches, or 75 percent, usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 4.4 inches at Ottertail on June 19, 1979, and 4.3 inches at Fergus Falls on August 7, 1992. Thunderstorms occur on about 32 days each year, and most occur in July.

The average seasonal snowfall is 49.9 inches at Ottertail and 40.3 inches at Fergus Falls. The greatest snow depth at any one time during the period of record was 34 inches at Ottertail and 27 inches at Fergus Falls. The heaviest 1-day snowfall on record was 14 inches at Ottertail and 12 inches at Fergus Falls.

The average relative humidity in midafternoon is about 62 percent. Humidity is higher at night, and the average at dawn is about 81 percent. The sun shines

67 percent of the time in summer and 50 percent in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 14 miles per hour, in April.

Temperature and Precipitation

(Recorded in the period 1961-90 at Ottertail and Fergus Falls, Minnesota)

Month	Temperature: Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Precipitation: Average	2 years in 10 will have-- Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
OTTERTAIL:											
January----	17.4	-4.0	6.7	45	-36	0	0.93	0.31	1.45	3	11.6
February---	23.8	1.5	12.6	48	-34	1	.67	.27	1.01	3	8.3
March------	36.7	15.9	26.3	64	-22	17	1.38	.74	1.95	4	9.9
April------	54.5	31.8	43.1	81	6	166	2.40	1.27	3.54	6	4.5
May--------	68.7	44.6	56.6	88	25	518	2.99	1.63	4.19	6	.1
June-------	77.4	54.6	66.0	93	38	775	4.34	2.76	5.77	7	.0
July-------	82.8	59.8	71.3	97	44	962	3.89	2.12	5.46	6	.0
August-----	80.3	57.4	68.9	95	40	890	3.34	1.43	4.97	5	.0
September--	69.7	47.6	58.6	90	28	559	2.49	1.13	3.65	5	.0
October----	57.3	36.6	46.9	81	18	248	2.25	.68	3.52	4	1.2
November---	37.7	21.0	29.3	63	-9	26	1.03	.40	1.57	3	7.6
December---	22.3	3.6	13.0	47	-30	1	.85	.35	1.27	3	9.7
Yearly:											
Average---	52.4	30.8	41.6	---	---	---	---	---	---	---	---
Extreme---	102	-41	---	98	-37	---	---	---	---	---	---
Total-----	---	---	---	---	---	4,165	26.58	21.85	31.03	55	52.9
FERGUS FALLS:											
January----	16.6	-3.4	6.6	44	-31	0	0.73	0.23	1.14	2	11.3
February---	22.7	2.4	12.6	47	-30	0	.55	.20	.84	2	6.3
March------	36.2	17.2	26.7	65	-17	18	1.14	.60	1.62	3	7.4
April------	53.8	32.2	43.0	83	9	159	2.06	.73	3.17	4	2.0
May--------	68.3	44.9	56.6	90	25	499	2.70	1.28	3.92	6	.0
June-------	76.8	54.3	65.6	94	39	739	3.75	2.15	5.17	6	.0
July-------	82.2	59.7	70.9	97	45	927	3.35	1.67	4.80	5	.0
August-----	80.1	56.9	68.5	96	41	854	3.12	1.59	4.45	5	.0
September--	69.3	46.8	58.1	91	28	521	2.48	1.03	3.71	4	.0
October----	57.2	35.6	46.4	83	17	224	1.80	.55	2.81	3	.2
November---	37.5	20.8	29.1	64	-8	24	.91	.30	1.42	2	4.7
December---	21.5	4.0	12.8	47	-26	1	.66	.23	1.02	2	9.0
Yearly:											
Average---	51.8	30.9	41.4	---	---	---	---	---	---	---	---
Extreme---	102	-40	---	102	-33	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,965	23.24	14.88	29.35	44	40.9

* 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 (40 degrees F).

Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Ottertail and Fergus Falls, Minnesota)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
OTTERTAIL			
Last freezing temperature in spring:			
1 year in 10 later than--	May 1	May 13	May 21
2 years in 10 later than--	Apr. 26	May 8	May 17
5 years in 10 later than--	Apr. 17	Apr. 29	May 8
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 8	Sept. 26	Sept. 15
2 years in 10 earlier than--	Oct. 13	Oct. 1	Sept. 19
5 years in 10 earlier than--	Oct. 22	Oct. 10	Sept. 28
FERGUS FALLS			
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 28	May 12	May 22
2 years in 10 later than--	Apr. 24	May 7	May 17
5 years in 10 later than--	Apr. 15	Apr. 26	May 7
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 2	Sept. 24	Sept. 14
2 years in 10 earlier than--	Oct. 8	Sept. 29	Sept. 18
5 years in 10 earlier than--	Oct. 17	Oct. 8	Sept. 28

Growing Season

(Recorded in the period 1961-90 at Ottertail and Fergus Falls, Minnesota)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
OTTERTAIL:			
9 years in 10	156	140	126
8 years in 10	163	146	131
5 years in 10	175	158	141
2 years in 10	188	170	151
1 year in 10	194	176	156
FERGUS FALLS:			
9 years in 10	155	138	122
8 years in 10	162	145	129
5 years in 10	175	160	142
2 years in 10	188	175	155
1 year in 10	194	183	161

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 areas are called soil 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.

Soils That Formed Dominantly in Loamy Glacial Till and Organic Material Under Dominantly Forested Vegetation

1. Blowers-Paddock-Cathro Association

Setting

Landform and position on the landform: Backslopes and toeslopes on drumlins and depressions between drumlins (fig. 3)
Slope range: 0 to 5 percent

Composition

Percent of the survey area: 6
Extent of the components in the association:
Blowers and similar soils—43 percent
Paddock and similar soils—18 percent
Cathro and similar soils—15 percent
Minor soils—24 percent

Soil Properties and Qualities

Blowers

Drainage class: Moderately well drained
Parent material: Till
Surface texture: Fine sandy loam

Paddock

Drainage class: Somewhat poorly drained
Parent material: Till
Surface texture: Sandy loam

Cathro

Drainage class: Very poorly drained
Parent material: Organic material over glaciolacustrine deposits or till
Surface texture: Muck

Minor Soils

- Pinelake and similar soils
- Epoufette and similar soils
- Oylen and similar soils
- Runeberg and similar soils
- Rockwood and similar soils
- Hillview and similar soils
- Becida and similar soils

Soils That Formed Dominantly in Loamy Glacial Till and Organic Material Under Dominantly Prairie Vegetation

2. Chapett-Sisseton-Friberg Association

Setting

Landform and position on the landform: Backslopes, summits, and swales on moraines (fig. 4)
Slope range: 0 to 30 percent

Composition

Percent of the survey area: 8
Extent of the components in the association:
Chapett and similar soils—52 percent

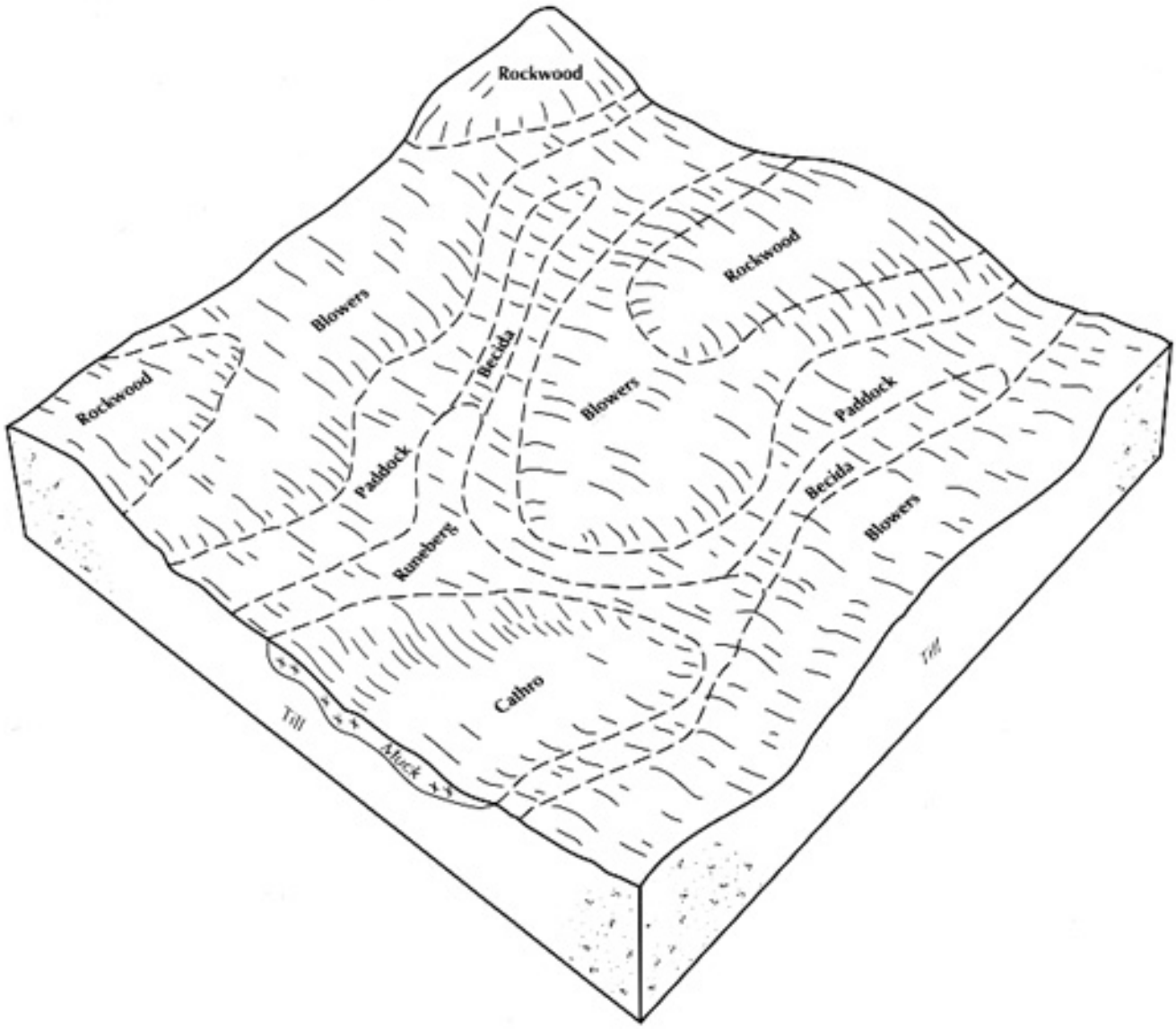


Figure 3.—Typical pattern of soils and parent material in the Blowers-Paddock-Cathro association.

Sisseton and similar soils—17 percent
Friberg and similar soils—10 percent
Minor soils—21 percent

Soil Properties and Qualities

Chapett

Drainage class: Well drained
Parent material: Till
Surface texture: Loam

Sisseton

Drainage class: Well drained
Parent material: Till
Surface texture: Loam

Friberg

Drainage class: Poorly drained
Parent material: Colluvium over till
Surface texture: Loam

Minor Soils

- Quam and similar soils
- Weetown and similar soils
- Lizzie and similar soils
- Cathro and similar soils

3. Sisseton-Heimdal-Quam Association

Setting

Landform and position on the landform: Backslopes, summits, and depressions on moraines
Slope range: 0 to 30 percent

Composition

Percent of the survey area: 3
Extent of the components in the association:
Sisseton and similar soils—37 percent
Heimdal and similar soils—29 percent
Quam and similar soils—9 percent
Minor soils—25 percent

Soil Properties and Qualities

Sisseton

Drainage class: Well drained
Parent material: Till
Surface texture: Loam

Heimdal

Drainage class: Well drained
Parent material: Till
Surface texture: Loam

Quam

Drainage class: Very poorly drained
Parent material: Glaciolacustrine deposits over till
Surface texture: Silt loam

Minor Soils

- Lakepark and similar soils
- Darnen and similar soils
- Arvilla and similar soils
- Sandberg and similar soils

4. Formdale-Aazdahl-Parnell Association

Setting

Landform and position on the landform: Backslopes, summits, swales, toeslopes, and rises on moraines
Slope range: 0 to 20 percent

Composition

Percent of the survey area: 4

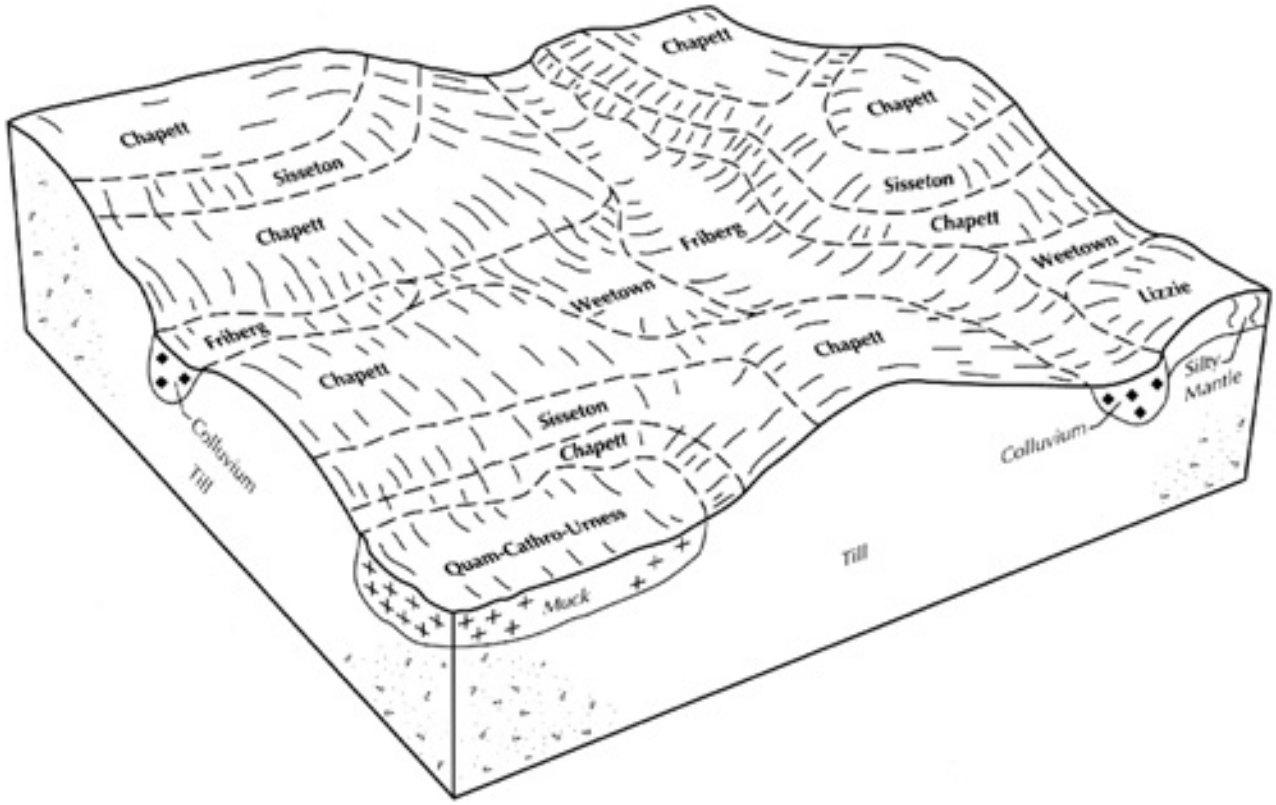


Figure 4.—Typical pattern of soils and parent material in the Chapett-Sisseton-Friberg association.

Extent of the components in the association:
Formdale and similar soils—32 percent
Aazdahl and similar soils—26 percent
Parnell and similar soils—12 percent
Minor soils—30 percent

Soil Properties and Qualities

Formdale

Drainage class: Well drained
Parent material: Till
Surface texture: Clay loam

Aazdahl

Drainage class: Moderately well drained
Parent material: Till
Surface texture: Clay loam

Parnell

Drainage class: Poorly drained
Parent material: Glaciolacustrine deposits over till
Surface texture: Silt loam

Minor Soils

- Buse and similar soils
- Hamerly and similar soils
- Roliss and similar soils
- Langhei and similar soils
- Quam and similar soils

5. Barnes-Langhei-Lakepark Association

Setting

Landform and position on the landform: Backslopes, summits, and swales on moraines (fig. 5)
Slope range: 1 to 20 percent

Composition

Percent of the survey area: 6
Extent of the components in the association:
Barnes and similar soils—40 percent
Langhei and similar soils—26 percent
Lakepark and similar soils—14 percent
Minor soils—20 percent

Soil Properties and Qualities

Barnes

Drainage class: Well drained
Parent material: Till
Surface texture: Loam

Langhei

Drainage class: Well drained
Parent material: Till
Surface texture: Loam

Lakepark

Drainage class: Poorly drained
Parent material: Colluvium over till
Surface texture: Loam

Minor Soils

- Darnen and similar soils
- Hamerly and similar soils
- Rothsay and similar soils
- Buse and similar soils
- Quam and similar soils

Soils That Formed Dominantly in Loamy Glacial Till and Sandy Glacial Outwash Under Dominantly Forested Vegetation

6. Snellman-Naytahwaush-Lida Association

Setting

Landform and position on the landform: Backslopes and summits on moraines (fig. 6)
Slope range: 1 to 45 percent

Composition

Percent of the survey area: 11
Extent of the components in the association:
Snellman and similar soils—53 percent
Naytahwaush and similar soils—13 percent
Lida and similar soils—8 percent
Minor soils—26 percent

Soil Properties and Qualities

Snellman

Drainage class: Well drained
Parent material: Till
Surface texture: Sandy loam

Naytahwaush

Drainage class: Well drained
Parent material: Till
Surface texture: Clay loam

Lida

Drainage class: Well drained

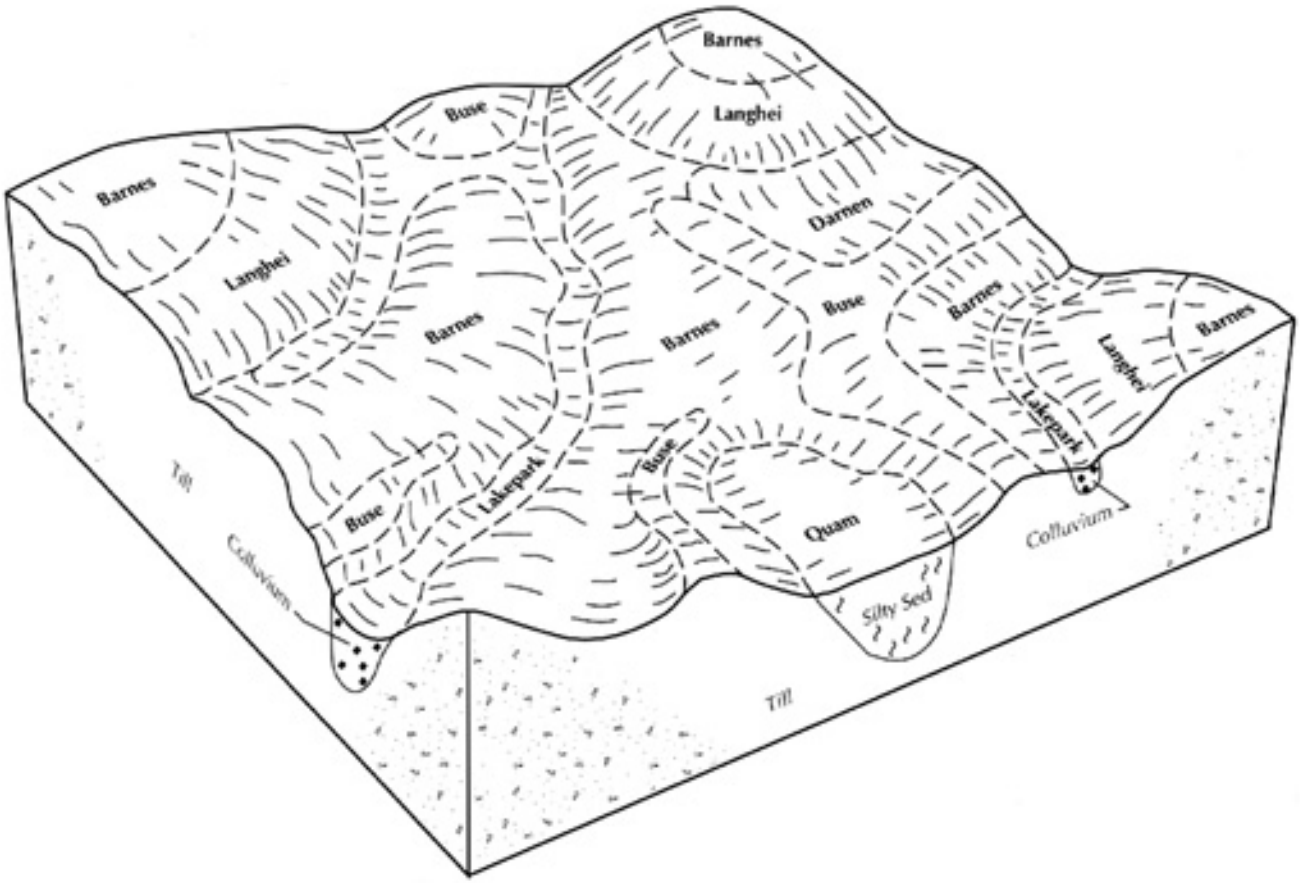


Figure 5.—Typical pattern of soils and parent material in the Barnes-Langhei-Lakepark association.

Parent material: Glacial outwash
Surface texture: Sandy loam

Minor Soils

- Mahkonce and similar soils
- Knute and similar soils
- Cathro and similar soils
- Brandsvold and similar soils
- Seelyeville and similar soils
- Egglake and similar soils

Soils That Formed Dominantly in Loamy Glacial Till and Organic Material Under Mixed Prairie and Forested Vegetation

7. Forman-Buse-Peever Association

Setting

Landform and position on the landform: Backslopes and summits on moraines (fig. 7)

Slope range: 2 to 20 percent

Composition

Percent of the survey area: 6
Extent of the components in the association:
Forman and similar soils—36 percent
Buse and similar soils—16 percent
Peever and similar soils—15 percent
Minor soils—33 percent

Soil Properties and Qualities

Forman

Drainage class: Well drained
Parent material: Till
Surface texture: Clay loam

Buse

Drainage class: Well drained
Parent material: Till
Surface texture: Loam

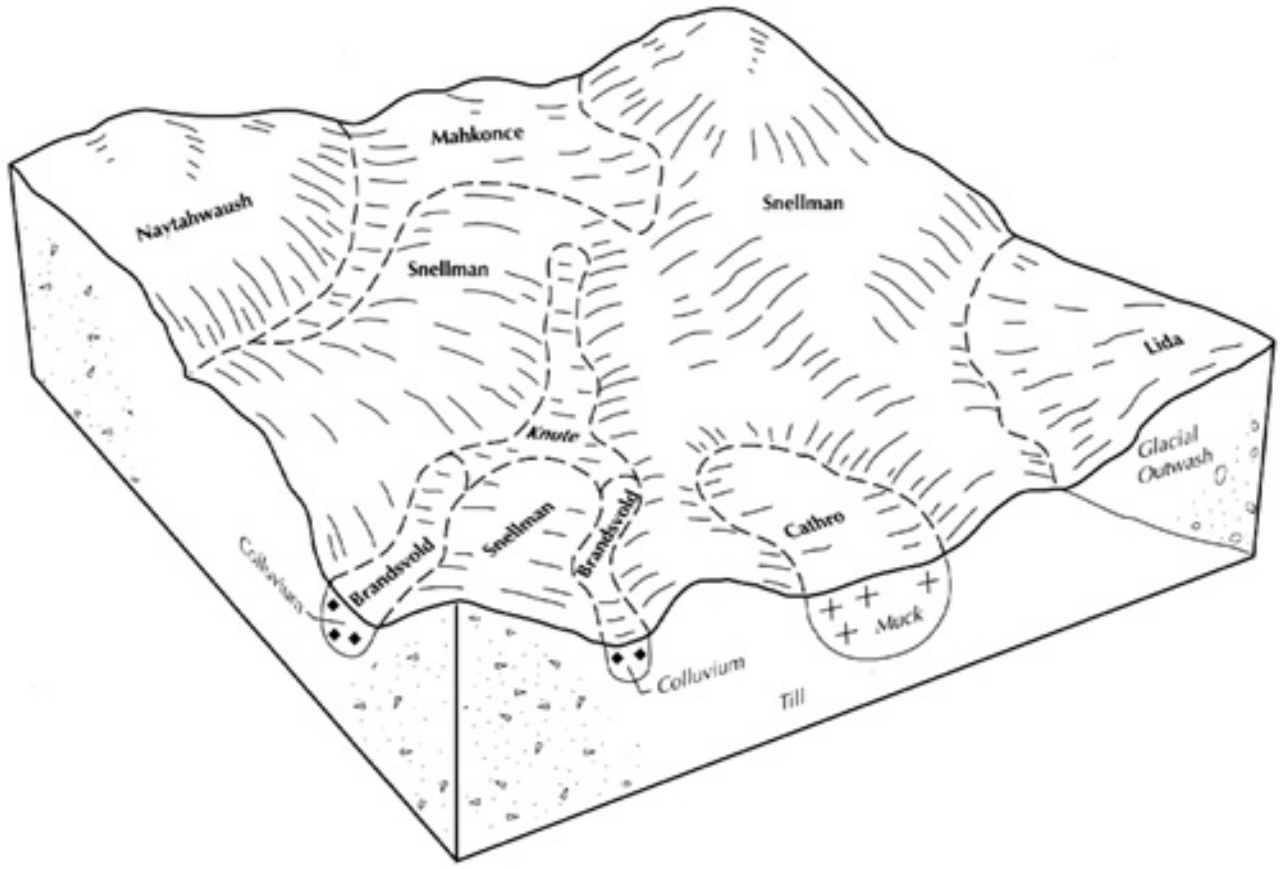


Figure 6.—Typical pattern of soils and parent material in the Snellman-Naytahwaush-Lida association.

Peever

Drainage class: Well drained
Parent material: Till
Surface texture: Clay loam

Minor Soils

- Mehurin and similar soils
- Parnell and similar soils
- Gonvick and similar soils
- Parnell, depressional, and similar soils
- Cathro and similar soils

8. Kandota-Knute-Brandsvold Association

Setting

Landform and position on the landform: Backslopes, toeslopes, and swales on moraines (fig. 8)
Slope range: 0 to 20 percent

Composition

Percent of the survey area: 12
Extent of the components in the association:
Kandota and similar soils—57 percent
Knute and similar soils—18 percent
Brandsvold and similar soils—9 percent
Minor soils—16 percent

Soil Properties and Qualities

Kandota

Drainage class: Well drained
Parent material: Till
Surface texture: Sandy loam

Knute

Drainage class: Moderately well drained
Parent material: Till
Surface texture: Fine sandy loam

Brandsvold

Drainage class: Poorly drained
Parent material: Till
Surface texture: Fine sandy loam

Minor Soils

- Cathro and similar soils
- Lida and similar soils
- Nitche and similar soils
- Clitherall and similar soils
- Pinelake, till substratum, and similar soils
- Bluffton and similar soils
- Leaflake and similar soils

9. Waukon-Cathro-Gonvick Association

Setting

Landform and position on the landform: Backslopes, summits, depressions, swales, toeslopes, and footslopes on moraines (fig. 9)
Slope range: 0 to 30 percent

Composition

Percent of the survey area: 4
Extent of the components in the association:
Waukon and similar soils—55 percent
Cathro and similar soils—15 percent
Gonvick and similar soils—10 percent
Minor soils—20 percent

Soil Properties and Qualities

Waukon

Drainage class: Well drained
Parent material: Till
Surface texture: Loam

Cathro

Drainage class: Very poorly drained
Parent material: Organic material over glaciolacustrine deposits or till
Surface texture: Muck

Gonvick

Drainage class: Moderately well drained

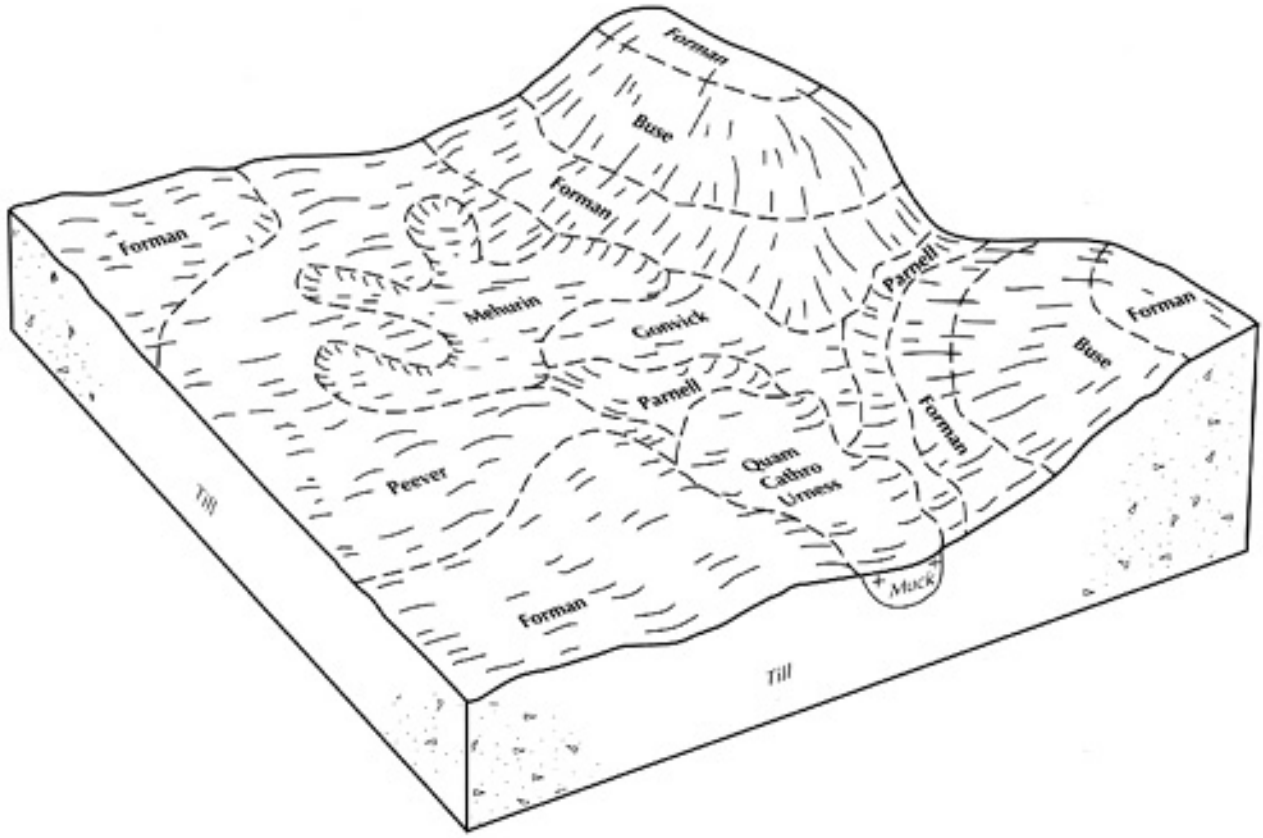


Figure 7.—Typical pattern of soils and parent material in the Forman-Buse-Peever association.

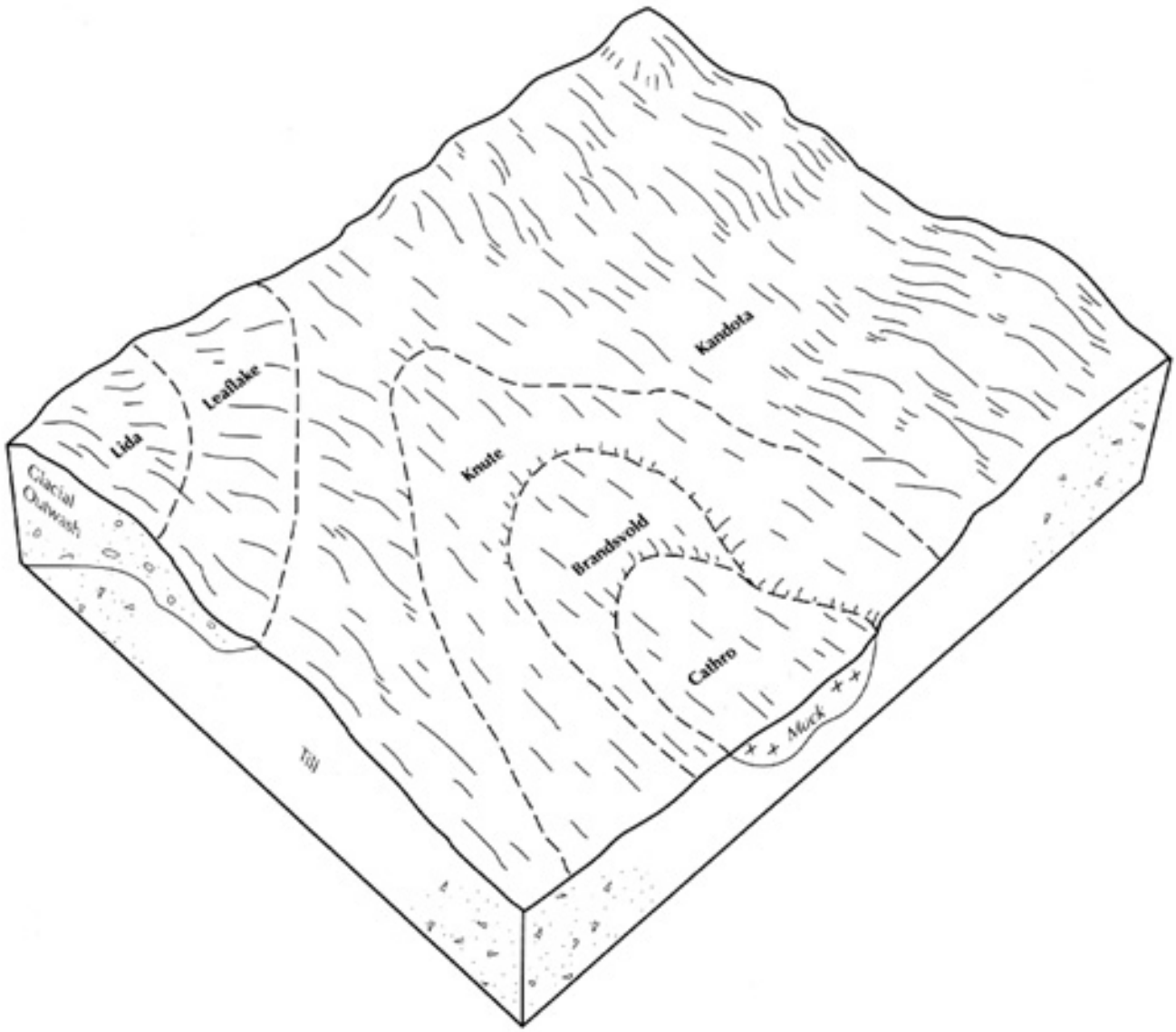


Figure 8.—Typical pattern of soils and parent material in the Kandota-Knute-Brandsvold association.

Parent material: Till
Surface texture: Loam

Minor Soils

- Parnell and similar soils
- Naytahwaush and similar soils
- Parnell, depressional, and similar soils
- Bygland and similar soils

Soils That Formed Dominantly in Organic Material and Sandy Glacial Outwash

Under Mixed Forested and Prairie Vegetation

10. Nidaros-Seelyeville-Pinelake Association

Setting

Landform and position on the landform: Depressions, flats, and rises on outwash plains
Slope range: 0 to 2 percent

Composition

Percent of the survey area: 1
Extent of the components in the association:
Nidaros and similar soils—37 percent
Seelyeville and similar soils—24 percent
Pinelake and similar soils—21 percent
Minor soils—18 percent

Soil Properties and Qualities

Nidaros

Drainage class: Very poorly drained
Parent material: Organic materials over glacial outwash
Surface texture: Muck

Seelyeville

Drainage class: Very poorly drained
Parent material: Organic materials
Surface texture: Muck

Pinelake

Drainage class: Poorly drained
Parent material: Glacial outwash
Surface texture: Sandy loam

Minor Soils

- Isan and similar soils
- Epoufette and similar soils
- Meehan and similar soils
- Eagleview and similar soils
- Oylen and similar soils

Figure 9.—An area of the Waukon-Cathro-Gonvick association. Water erosion is a management concern in the more sloping areas, and the depth to the water table is a concern in the nearly level or concave areas.

Soils That Formed Dominantly in Sandy Glacial Outwash and Organic Material Under Dominantly Prairie Vegetation

11. Hubbard-Duelm-Nidaros Association

Setting

Landform and position on the landform: Backslopes, rises, flats, and depressions on outwash plains
Slope range: 0 to 12 percent

Composition

Percent of the survey area: 3
Extent of the components in the association:
Hubbard and similar soils—77 percent
Duelm and similar soils—6 percent
Nidaros and similar soils—2 percent
Minor soils—15 percent

Soil Properties and Qualities

Hubbard

Drainage class: Excessively drained
Parent material: Glacial outwash
Surface texture: Loamy sand

Duelm

Drainage class: Moderately well drained
Parent material: Glacial outwash
Surface texture: Loamy sand

Nidaros

Drainage class: Very poorly drained
Parent material: Organic materials over glacial outwash
Surface texture: Muck

Minor Soils

- Forada and similar soils
- Isan and similar soils
- Sverdrup and similar soils
- Verndale and similar soils
- Clontarf and similar soils
- Oylen and similar soils

12. Dorset-Corliss-Nidaros Association

Setting

Landform and position on the landform: Summits, backslopes, and depressions on outwash plains (fig. 10)
Slope range: 0 to 35 percent

Composition

Percent of the survey area: 13
Extent of the components in the association:
Dorset and similar soils—53 percent
Corliss and similar soils—16 percent
Nidaros and similar soils—8 percent
Minor soils—23 percent

Soil Properties and Qualities

Dorset

Drainage class: Well drained
Parent material: Glacial outwash
Surface texture: Sandy loam

Corliss

Drainage class: Excessively drained
Parent material: Glacial outwash
Surface texture: Loamy sand

Nidaros

Drainage class: Very poorly drained
Parent material: Organic materials over glacial outwash
Surface texture: Muck

Minor Soils

- Oylen and similar soils
- Pinelake and similar soils
- Nitche and similar soils
- Almora and similar soils

13. Arvilla-Sverdrup-Sandberg Association

Setting

Landform and position on the landform: Flats, rises, and backslopes on outwash plains (fig. 11)
Slope range: 0 to 20 percent

Composition

Percent of the survey area: 12
Extent of the components in the association:
Arvilla and similar soils—34 percent
Sverdrup and similar soils—24 percent
Sandberg and similar soils—20 percent
Minor soils—22 percent

Soil Properties and Qualities

Arvilla

Drainage class: Somewhat excessively drained
Parent material: Glacial outwash

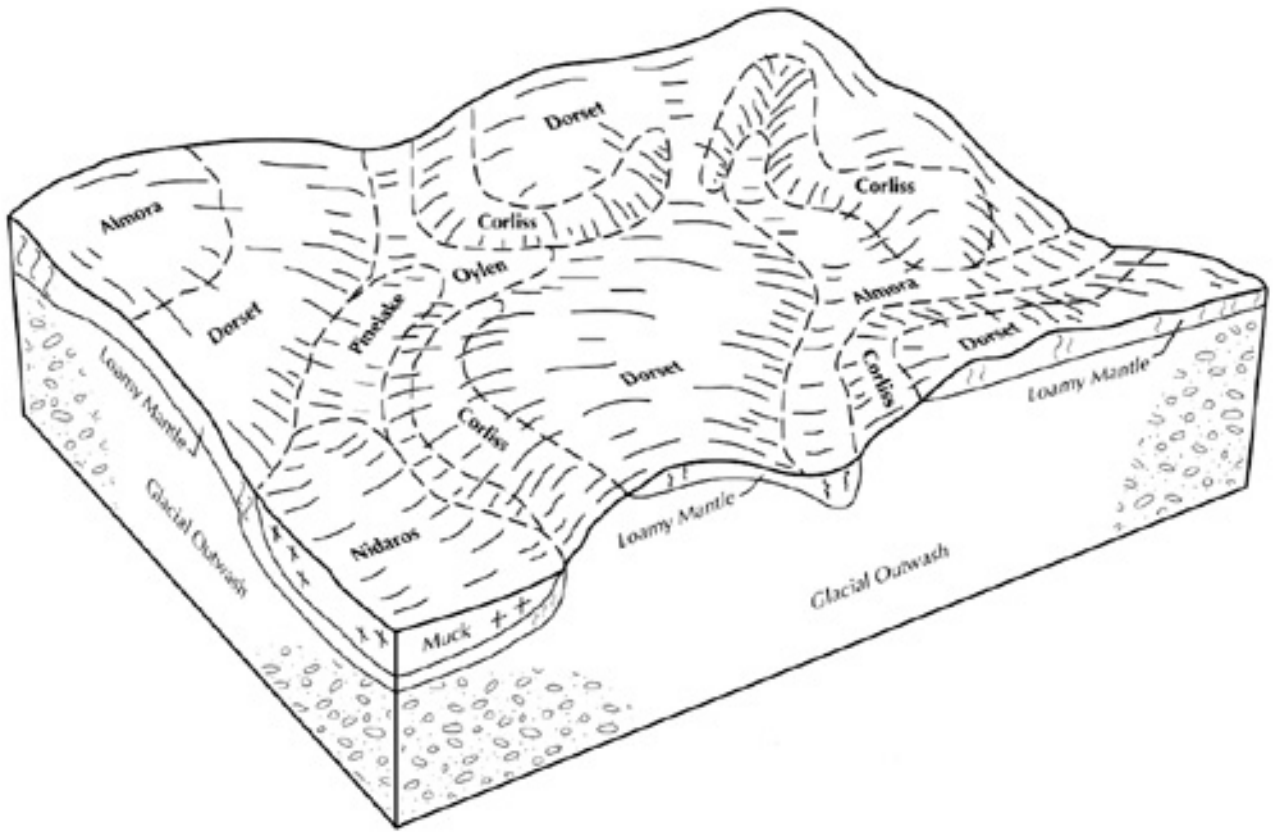


Figure 10.—Typical pattern of soils and parent material in the Dorset-Corliss-Nidaros association.

Surface texture: Sandy loam

Sverdrup

Drainage class: Well drained
Parent material: Glacial outwash
Surface texture: Sandy loam

Sandberg

Drainage class: Excessively drained
Parent material: Glacial outwash
Surface texture: Loamy sand

Minor Soils

- Fordville and similar soils
- Clontarf and similar soils
- Oylen and similar soils
- Corliss and similar soils
- Forada and similar soils
- Nidaros and similar soils

Soils That Formed Dominantly in Sandy Glacial Outwash and Organic Material Under Dominantly Forested Vegetation

14. Bluffcreek-Nidaros-Epoufette Association

Setting

Landform and position on the landform: Swales, flats, depressions, and rises on outwash plains
Slope range: 0 to 3 percent

Composition

Percent of the survey area: 3
Extent of the components in the association:
Bluffcreek and similar soils—27 percent
Nidaros and similar soils—16 percent

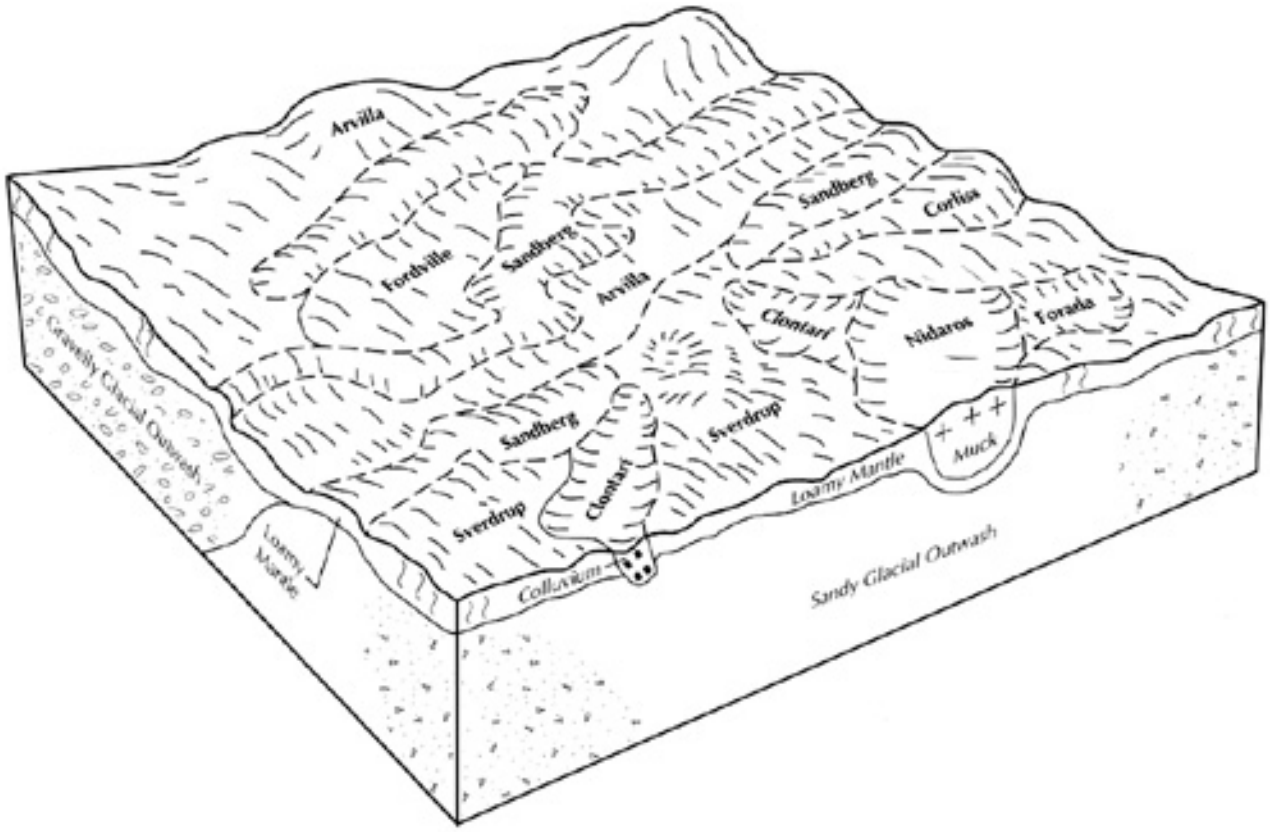


Figure 11.—Typical pattern of soils and parent material in the Arvilla-Sverdrup-Sandberg association.

Epoufette and similar soils—14 percent
Minor soils—43 percent

Soil Properties and Qualities

Bluffcreek

Drainage class: Moderately well drained
Parent material: Glacial outwash
Surface texture: Sandy loam

Nidaros

Drainage class: Very poorly drained
Parent material: Organic materials over outwash
Surface texture: Muck

Epoufette

Drainage class: Poorly drained
Parent material: Glacial outwash
Surface texture: Sandy loam

Minor Soils

- Seelyeville and similar soils
- Lida and similar soils
- Eagleview and similar soils
- Clearriver and similar soils

15. Lida-Two Inlets-Nidaros Association

Setting

Landform and position on the landform: Backslopes, summits, and depressions on outwash plains and kame moraines (fig. 12)
Slope range: 0 to 50 percent

Composition

Percent of the survey area: 6
Extent of the components in the association:
Lida and similar soils—45 percent

Two Inlets and similar soils—30 percent
Nidaros and similar soils—10 percent
Minor soils—15 percent

Soil Properties and Qualities

Lida

Drainage class: Well drained
Parent material: Glacial outwash
Surface texture: Sandy loam

Two Inlets

Drainage class: Somewhat excessively drained
Parent material: Glacial outwash
Surface texture: Sandy loam

Nidaros

Drainage class: Very poorly drained
Parent material: Organic materials over outwash
Surface texture: Muck

Minor Soils

- Epoufette and similar soils
- Bluffcreek and similar soils
- Almora and similar soils

Soils That Formed Dominantly in Loamy Glacial Till and Sandy, Loamy, and Silty Glaciolacustrine Sediments Under Dominantly Prairie Vegetation

16. Hamerly-Rockwell-Mustinka Association

Setting

Landform and position on the landform: Flats, rises, and swales on lake plains
Slope range: 0 to 4 percent

Composition

Percent of the survey area: 1
Extent of the components in the association:
Hamerly and similar soils—33 percent
Rockwell and similar soils—19 percent
Mustinka and similar soils—13 percent
Minor soils—35 percent

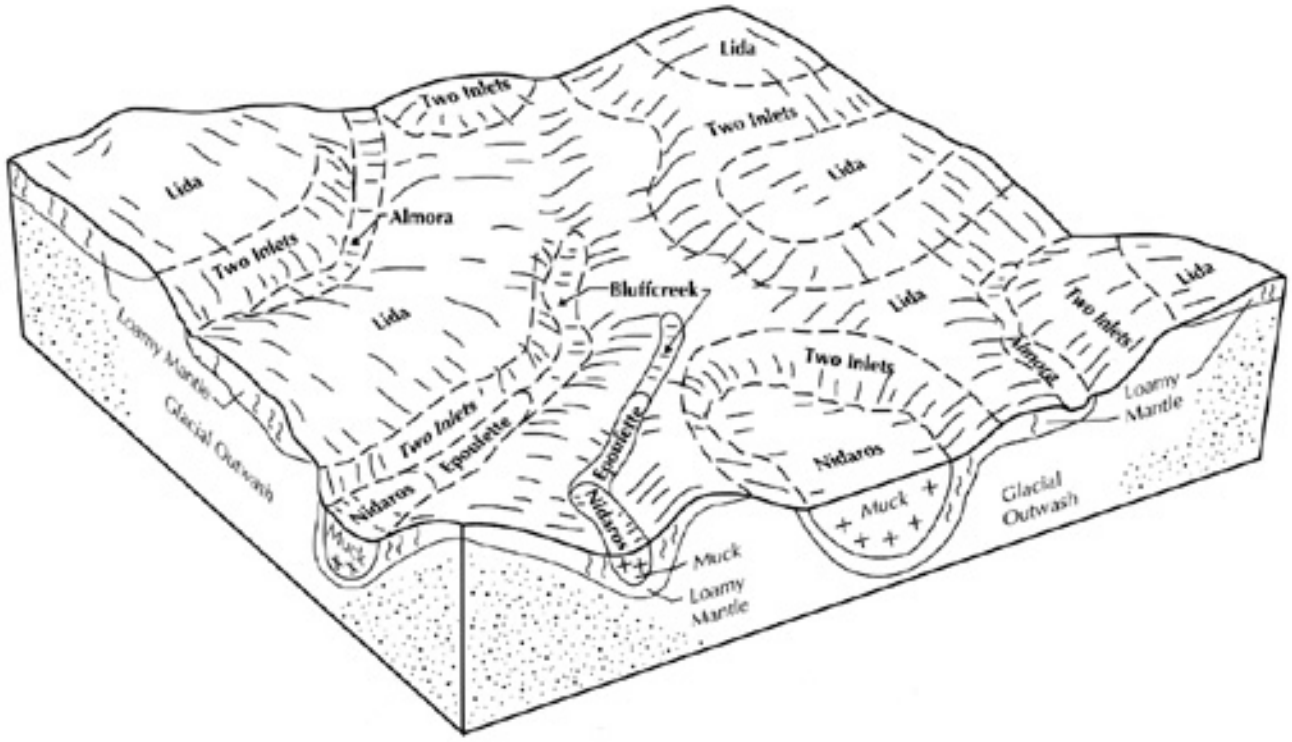


Figure 12.—Typical pattern of soils and parent material in the Lida-Two Inlets-Nidaros association.

Soil Properties and Qualities

Hamerly

Drainage class: Somewhat poorly drained
Parent material: Till
Surface texture: Clay loam

Rockwell

Drainage class: Poorly drained
Parent material: Glaciolacustrine deposits over till
Surface texture: Loam

Mustinka

Drainage class: Poorly drained
Parent material: Glaciolacustrine deposits over till
Surface texture: Silty clay loam

Minor Soils

- Roliss and similar soils
- Swenoda and similar soils
- Kittson and similar soils
- Sandberg and similar soils
- Doran and similar soils

17. Rockwell-Wolverton-Foldahl Association

Setting

Landform and position on the landform: Flats, rises, and swales on lake plains
Slope range: 0 to 3 percent

Composition

Percent of the survey area: 1
Extent of the components in the association:
Rockwell and similar soils—30 percent
Wolverton and similar soils—25 percent
Foldahl and similar soils—15 percent
Minor soils—30 percent

Soil Properties and Qualities

Rockwell

Drainage class: Poorly drained
Parent material: Glaciolacustrine deposits over till
Surface texture: Loam

Wolverton

Drainage class: Moderately well drained
Parent material: Glaciolacustrine deposits over till
Surface texture: Very fine sandy loam

Foldahl

Drainage class: Moderately well drained
Parent material: Glaciolacustrine deposits over till
Surface texture: Loamy fine sand

Minor Soils

- Hamerly and similar soils
- Arveson and similar soils
- Sandberg and similar soils
- Grimstad and similar soils
- Winger and similar soils

Formation and Classification of the Soils

This section relates the soils in the survey area to the major factors of soil formation and describes the system of soil classification.

Formation of the Soils

Soil is a natural body produced by the action of soil-forming processes on materials deposited or accumulated by geologic forces. Soils form through complex processes that can be grouped into four general categories. These are additions, removals, transfers, and transformations. These processes affect soil formation in differing degrees.

The accumulation of organic matter in the surface layer of the mineral soils is an example of an addition. This accumulation is the main reason for the dark color of the surface layer.

The leaching of calcium carbonate from the upper 1 to 4 feet in many of the soils in the county is an example of removal. Initially the parent material of these soils had calcium carbonate throughout, but the calcium carbonate has been moved down from the upper part of the soil profile by percolating water.

The translocation of clay from the surface layer or subsurface layer into the subsoil of the forested soils in the county is an example of a transfer. The surface and subsurface layers are zones of eluviation, or loss. The subsoil is a zone of illuviation, or gain. The subsoil has more clay than the parent material initially had. Thin clay films are in pores and on the faces of peds in the subsoil.

An example of a transformation is the reduction of iron. This process takes place under wet, saturated conditions in which there is no oxygen. Gleying, or iron depletion, is evident in the Bluffton, Forada, and Parnell soils, which have a dominantly gray subsoil. Reduced iron is soluble. It commonly has been moved short distances in the soils. Part of this iron can be reoxidized and segregated in the form of iron concentrations or concretions.

The soil-forming processes and the physical and chemical features of the soil in a given area are influenced by the composition of the parent material, the climate under which the soil material accumulated, the plant and animal life on and in the soil, the relief or topography, and the length of time that the forces of soil formation have acted on the soil material (Jenny, 1941). All of these factors of soil formation are interrelated. The interaction between one or more of the factors can influence the physical or chemical makeup of the soil. The following paragraphs describe the five major factors of soil formation.

Climate

Otter Tail County has a cool, subhumid, continental climate characterized by cold winters and hot summers. Water from melting snow and rainfall dissolves minerals and supports biological activity. Water transports minerals and organic residues into and across the soil. Temperature influences the kinds and growth rates of plants and animals in and on the soil. The rates of physical and chemical weathering of soil are also controlled by temperature. Freezing of the soil during the winter slows the soil-forming processes. The alternate freezing and thawing disintegrate the parent material, and frost heaving helps to mix the soil material. Rainfall can influence the downward or upward movement of calcium carbonate in the soil.

Climate was responsible for the types of vegetation under which the soils formed. Prairie vegetation enhanced the accumulation of organic matter in the soils, but less organic matter accumulated under forest vegetation.

Living Organisms

The native vegetation of Otter Tail County is grouped into five major types. The western one-third of the county was dominated by prairies. Forests of aspen-birch-conifer were in the northeastern part of the county. Between the prairie and pine forests are the hardwood forests of maple-basswood-oak and savannas of scattered bur oak or brush and grass. Throughout the county the lower lying areas are dominated by wetland vegetation. In the western part of the county, wetlands were dominantly marshes of cattails and sedges. In the eastern part of the county, the wetlands were dominated by tamarack and black ash. Fire was a major influence on the distribution of the vegetation types. Fires fashioned the prairies and the savannas. Fires were more prevalent on the

droughty outwash soils, which promoted prairie and savanna vegetation, than in forested areas. Areas characterized by lower evapotranspiration and soils with a greater water-holding capacity favored forest vegetation (Heinselman, 1974).

All forms of life, both in and on the soil, influence the chemical, physical, and biological processes associated with soil formation. Bacteria, earthworms, and other forms of animal life aid in the weathering of materials, the transformation processes, and the decomposition of organic matter. Also, earthworms and small burrowing animals help to mix soil materials in the surface layer and subsoil. Plants, including fungi, influence soil formation by returning decaying plant residue to the soil and furthering decomposition. Plant roots loosen the soil and bring minerals up from the parent material. Vegetation influences soil structure and the movement of nutrients up and down through the soil. Generally, plants have a greater influence than animals on soil formation.

Human activities also influence soil formation. Farming and land clearing practices increase the intensity of some soil-forming processes. Accelerated erosion of the surface layer has occurred in unprotected areas of farmland. Such activities as altering drainage conditions, maintaining fertility, changing vegetation, and altering runoff and the infiltration of water continue to have an important effect on soil formation.

Topography

Topography is an important factor in soil formation because it affects drainage, aeration, and erosion. Differences in topography can account for the formation of different soils from the same parent material. Topography influences runoff and drainage conditions that can affect types of vegetation and chemical changes taking place on or in the soil. Runoff reduces the amount of water that can leach the soil and be used by plants. Uncontrolled runoff causes erosion.

Soil drainage classes can be related to the position of the soil on the landscape. For example, the positions of Kandota, Knute, Brandsvold, and Bluffton soils, which occur on the Henning Till Plain, are generally predictable. Each soil occupies a particular landscape position. The well drained Kandota soils are on convex, gently sloping to moderately steep backslopes; the moderately well drained Knute soils are on plane, gently sloping footslopes and toeslopes; the poorly drained Brandsvold soils are in nearly level, plane and slightly concave positions on toeslopes and head slopes and in shallow drainageways; and the very poorly drained Bluffton soils are in depressions and the more concave drainageways. In Otter Tail County, relief ranges from level to very steep.

Parent Material

The parent materials of most of the soils in Otter Tail County were directly or indirectly derived from a series of glaciers that spread across the county and later melted. Glacial till, glacial outwash, and glaciolacustrine deposits are general terms used to characterize the type and origin of the parent materials and the associated geomorphic area where the parent materials occur.

As different glaciers advanced across the land, rocks, clay, silt, and sand were transported and deposited by the glacial ice, by the melting ice, or from meltwaters flowing from the ice. The physical and chemical properties of the parent material were acquired from areas over which the glacial ice advanced.

About 60 percent of the soils in the county formed in glacial till, 36 percent in glacial outwash, 2 percent in glaciolacustrine deposits, and 2 percent in organic material, dominantly herbaceous plants. The parent materials are generally associated with a distinct geomorphic area.

The two main types of glacial till in the county are characterized by the percent of clay, sand, and silt; soil reaction; and type of stones making up the till fabric. The tills are separated into two main groups. Tills that have less than 18 percent clay are generally called the Wadena Lobe or Winnipeg Lobe Till. Till that contains more than 18 percent clay is recognized as the Des Moines Lobe Till (Hobbs and Goebel, 1982).

The parent material on the Henning Till Plain is dominantly Wadena Lobe Till. Brandsvold, Kandota, and Knute soils are the major soils that formed in this till. Clitherall, Leaflake, and Nitche soils are representative of soils that formed in sandy eolian or outwash material deposited over till.

The dominant parent materials of the Alexandria Moraine consist of both Wadena Lobe and Des Moines Lobe Till (Schneider). Chapett, Friberg, Heimdal, Sisseton, and Snellman soils formed in Wadena Lobe Till. Forman, Gonvick, Naytahwaush, Parnell, Peever, and Waukon soils are examples of soils that formed in Des Moines Lobe Till in the Alexandria and Altamont Moraines. Also, there are local areas of outwash, glaciolacustrine deposits, and organic soils and areas that have clayey or silty lacustrine sediments over both types of till. Also in the Alexandria Moraine are ice-walled lake plains. The soils in these areas formed in thick, clayey lacustrine sediments.

The dominant parent material of the Big Stone Moraine is fine loamy till. Barnes, Langhei, Lakepark, Formdale, Aazdahl, and Parnell soils are the major soils that formed in this till. Cathro soils formed in organic material over till. Seelyeville and Rifle soils formed in deep or very deep organic material on till plains and moraines.

Several outwash sediments derived from different sources and at different times are scattered throughout the county on pitted outwash plains and kame moraines. The parent material ranges from sands to loamy mantled sands and gravels. Hubbard, Duelm, Dorset, Corliss, Pinelake, Oylen, Arvilla, Sandberg, Lida, Two Inlets, and Eagleview soils are the major soils that formed in outwash. Nidaros soils formed in organic material over loamy sediments underlain by sandy or gravelly sediments. Rifle and Seelyeville soils are the major soils that formed in deep or very deep organic materials on outwash plains.

The parent materials of the Red River Valley, formerly Glacial Lake Agassiz, are fine-loamy till and glaciolacustrine deposits. Hamerly, Doran, and Grimstad soils are the major soils in the part of the Red River Valley that is in Otter Tail County.

Time

Time is required for the transformation of the parent material into a natural body that exhibits genetically altered soil layers or soil development. Generally, the maturity of a soil is indicated by the degree of soil development.

Immediately after the glacier receded and outwash materials were deposited about 10,000 to 12,000 years ago, the soil could not support the vegetation or crops that are now grown. Plants that could grow on fresh parent material and tolerate the cold climate contributed to soil development. With time, climatic changes, and the succession of plants, soils reached a state of relative equilibrium. This state of equilibrium between the soil, vegetation, and climate was changed when the clearing and plowing of land began about 135 years ago.

The catena of Rockwood, Blowers, and Paddock soils in the Wadena Drumlin Field represents the most mature or oldest soils in Otter Tail County. This fact is based on the age and source of the parent material as determined by laboratory analysis and on the extent of soil development. Soils that formed in recent lake beach deposits and in the alluvium along rivers and streams are young and exhibit no soil development or only weak development. In respect to geological time, all of the soils in the county are young.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 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. The table “Classification of the Soils” in Parts I and II of this publication 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 Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Endoaquolls (*Endo*, meaning within, plus *aquoll*, the suborder of the Mollisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Endoaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and

characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Endoaquolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

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
Aazdahl	Aquic Haploborolls, fine-loamy, mixed
Abbeylake	Typic Udipsamments, mixed, frigid
Almora	Boralfic Udic Argiborolls, fine-loamy over sandy or sandy-skeletal, mixed
Aquolls	Aquolls
Arveson	Typic Calciaquolls, coarse-loamy, frigid
Arvilla	Udic Haploborolls, sandy, mixed
Barnes	Udic Haploborolls, fine-loamy, mixed
Becida	Mollic Glossaqualfs, coarse-loamy, mixed, frigid
Bemidji	Aquic Arenic Eutroboralfs, loamy, mixed
Blowers	Glossaquic Eutroboralfs, coarse-loamy, mixed
Bluffcreek	Oxyaquic Eutroboralfs, coarse-loamy, mixed
Bluffton	Typic Endoaquolls, fine-loamy, mixed, frigid
Borup	Typic Calciaquolls, coarse-silty, frigid
Brandsvold	Typic Argiaquolls, fine-loamy, mixed, frigid
Buse	Udic Calciborolls, fine-loamy, mixed
Bygland	Aquertic Argiborolls, fine, montmorillonitic
Cathro	Terric Borosaprists, loamy, mixed, euic
Chapett	Boralfic Udic Argiborolls, fine-loamy, mixed
Clearriver	Aquic Udipsamments, mixed, frigid
Clitherall	Aquic Argiborolls, coarse-loamy, mixed
Clontarf	Pachic Udic Haploborolls, coarse-loamy, mixed
Clotho	Typic Endoaquolls, coarse-loamy, mixed (calcareous), frigid
Corliss	Typic Udipsamments, mixed, frigid
Darnen	Pachic Udic Haploborolls, fine-loamy, mixed
Dent	Aquic Argiborolls, fine-silty, mixed
Dickey	Udorthentic Haploborolls, sandy over loamy, mixed
Doran	Aquertic Argiborolls, fine, montmorillonitic
Dorset	Udic Argiborolls, coarse-loamy, mixed
Duelm	Aquic Haploborolls, sandy, mixed
Eagleview	Argic Udipsamments, mixed, frigid
Egeland	Udic Haploborolls, coarse-loamy, mixed
Egglake	Mollic Endoaqualfs, fine-loamy, mixed, frigid
Epoufette	Mollic Endoaqualfs, coarse-loamy, mixed, frigid
Flaming	Aquic Haploborolls, sandy, mixed
Foldahl	Aquic Haploborolls, sandy over loamy, mixed
Forada	Typic Endoaquolls, coarse-loamy, mixed, frigid
Fordville	Pachic Udic Haploborolls, fine-loamy over sandy or sandy-skeletal, mixed
Forman	Udic Argiborolls, fine-loamy, mixed
Formdale	Udic Haploborolls, fine-loamy, mixed
Foxhome	Aquic Haploborolls, sandy-skeletal over loamy, mixed
Friberg	Typic Argiaquolls, fine-loamy, mixed, frigid
Glyndon	Aeric Calciaquolls, coarse-silty, frigid
Gonvick	Aquic Argiborolls, fine-loamy, mixed
Grimstad	Aeric Calciaquolls, sandy over loamy, frigid
Hamerly	Aeric Calciaquolls, fine-loamy, frigid
*Hangaard	Typic Endoaquolls, sandy, mixed, frigid
Hantho	Pachic Udic Haploborolls, coarse-silty, mixed
Haslie	Limnic Borosaprists, coprogenous, euic
Haug	Histic Humaquepts, coarse-loamy, mixed (calcareous), frigid
Heimdal	Udic Haploborolls, coarse-loamy, mixed
Hillview	Mollic Endoaqualfs, coarse-loamy, mixed, frigid
Hubbard	Udorthentic Haploborolls, sandy, mixed
Isan	Typic Endoaquolls, sandy, mixed, frigid
Kandota	Mollic Eutroboralfs, fine-loamy, mixed
Kittson	Aquic Haploborolls, fine-loamy, mixed
Knute	Aquic Argiborolls, fine-loamy, mixed
Kratka	Typic Epiaquolls, sandy over loamy, mixed, frigid
Lakepark	Cumulic Endoaquolls, fine-loamy, mixed, frigid
Lamoure	Cumulic Endoaquolls, fine-silty, mixed (calcareous), frigid
Langhei	Typic Eutrochrepts, fine-loamy, mixed, frigid

Classification of the Soils--Continued

Soil name	Family or higher taxonomic class
Leaflake	Arenic Eutroboralfs, loamy, mixed
Leafriver	Histic Humaquepts, sandy, mixed, frigid
Lida	Mollic Eutroboralfs, coarse-loamy, mixed
Lindaas	Typic Argiaquolls, fine, montmorillonitic, frigid
Lizzie	Boralfic Udic Argiborolls, fine-silty, mixed
Mahkonce	Aquic Eutroboralfs, fine, montmorillonitic
McIntosh	Aeric Calciaquolls, fine-silty, frigid
Meehan	Aquic Udipsamments, mixed, frigid
Mehurin	Aquertic Argiborolls, fine, montmorillonitic
Mustinka	Typic Argiaquolls, fine, montmorillonitic, frigid
Naytahwaush	Mollic Eutroboralfs, fine, montmorillonitic
Nidaros	Terric Borosaprists, loamy, mixed, euic
Nitche	Mollic Eutroboralfs, coarse-loamy, mixed
Oakcreek	Aquic Argiborolls, fine-loamy, mixed
Oylen	Aquic Argiborolls, coarse-loamy, mixed
Paddock	Udollic Epiaqualfs, coarse-loamy, mixed, frigid
Parnell	Vertic Argiaquolls, fine, montmorillonitic, frigid
Peever	Udic Argiborolls, fine, montmorillonitic
Pinelake	Typic Argiaquolls, coarse-loamy, mixed, frigid
Quam	Cumulic Endoaquolls, fine-silty, mixed, frigid
Radium	Aquic Haploborolls, sandy, mixed
Rifle	Typic Borohemists, euic
Rockwell	Typic Calciaquolls, coarse-loamy, frigid
Rockwood	Mollic Eutroboralfs, coarse-loamy, mixed
Roliss	Typic Endoaquolls, fine-loamy, mixed (calcareous), frigid
Roscommon	Mollic Psammaquents, mixed, frigid
Rosy	Glossaquic Eutroboralfs, coarse-loamy, mixed
Rothsay	Udic Haploborolls, coarse-silty, mixed
Runeberg	Typic Endoaquolls, coarse-loamy, mixed, frigid
Rushlake	Aquic Udipsamments, mixed, frigid
Sandberg	Udorthentic Haploborolls, sandy, mixed
Sedgeville	Fluvaquentic Endoaquolls, coarse-loamy, mixed, frigid
Seelyeville	Typic Borosaprists, euic
Sioux	Udorthentic Haploborolls, sandy-skeletal, mixed
Sisseton	Typic Eutrochrepts, coarse-loamy, mixed, frigid
Snellman	Typic Eutroboralfs, fine-loamy, mixed
Sugarbush	Typic Eutroboralfs, coarse-loamy, mixed
Sverdrup	Udic Haploborolls, sandy, mixed
Swenoda	Pachic Udic Haploborolls, coarse-loamy, mixed
Sybil	Mollic Eutroboralfs, coarse-loamy, mixed
Two Inlets	Psammentic Eutroboralfs, sandy, mixed
Udipsamments	Udipsamments
Udorthents	Udorthents
Urness	Mollic Fluvaquents, fine-silty, mixed (calcareous), frigid
Vallers	Typic Calciaquolls, fine-loamy, frigid
Verndale	Udic Argiborolls, coarse-loamy, mixed
Waukon	Mollic Eutroboralfs, fine-loamy, mixed
Weetown	Pachic Udic Argiborolls, fine-loamy, mixed
Winger	Typic Calciaquolls, fine-silty, frigid
Wolverton	Aquic Calciborolls, coarse-loamy, mixed
Wykeham	Aquic Eutroboralfs, fine-loamy, mixed
Wyndmere	Aeric Calciaquolls, coarse-loamy, frigid
Zell	Udic Calciborolls, coarse-silty, mixed

Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
7A	Hubbard loamy sand, 0 to 2 percent slopes	7,740	0.5
7B	Hubbard loamy sand, 2 to 6 percent slopes	14,297	1.0
7C	Hubbard loamy sand, 6 to 12 percent slopes	4,362	0.3
26	Aazdahl clay loam	9,254	0.6
34	Parnell silty clay loam, depressional	6,362	0.4
38B	Waukon loam, 2 to 6 percent slopes	8,073	0.6
38C2	Waukon loam, 6 to 12 percent slopes, eroded	9,893	0.7
38D2	Waukon loam, 12 to 20 percent slopes, eroded	3,229	0.2
38E	Waukon loam, 20 to 30 percent slopes	2,506	0.2
46	Borup loam	271	*
53B	Kandota sandy loam, 2 to 6 percent slopes	29,873	2.1
53C	Kandota sandy loam, 6 to 12 percent slopes	10,893	0.8
53D	Kandota sandy loam, 12 to 20 percent slopes	1,909	0.1
58	Kittson loam	1,338	*
59	Grimstad fine sandy loam	548	*
61	Arveson loam	1,350	*
63	Rockwell loam	4,579	0.3
65	Foxhome sandy loam	484	*
66	Flaming loamy fine sand	102	*
68	Arveson loam, depressional	3,157	0.2
107	Winger silt loam	522	*
108	McIntosh silt loam	110	*
121	Wykeham fine sandy loam	6,652	0.5
127A	Sverdrup sandy loam, 0 to 2 percent slopes	1,147	*
127B	Sverdrup sandy loam, 2 to 6 percent slopes	3,663	0.2
127C	Sverdrup sandy loam, 6 to 12 percent slopes	1,064	*
141B	Egeland fine sandy loam, 1 to 6 percent slopes	2,771	0.2
141C	Egeland fine sandy loam, 6 to 12 percent slopes	1,450	0.1
141D	Egeland fine sandy loam, 12 to 20 percent slopes	428	*
168B	Forman clay loam, 2 to 6 percent slopes	7,929	0.6
180	Gonvick loam	4,483	0.3
184	Hamerly loam	2,066	0.1
187	Haug muck	407	*
191	Epoufette sandy loam	8,315	0.6
202	Meehan loamy sand	1,009	*
258A	Sandberg loamy sand, 0 to 2 percent slopes	10,194	0.7
258B	Sandberg loamy sand, 1 to 6 percent slopes	2,121	0.1
258C	Sandberg loamy sand, 6 to 12 percent slopes	1,735	0.1
260	Duelm loamy sand	2,217	0.2
267B	Snellman sandy loam, 2 to 8 percent slopes	13,321	0.9
267C	Snellman sandy loam, 8 to 15 percent slopes	15,906	1.1
267E	Snellman sandy loam, 15 to 30 percent slopes	10,315	0.7
267F	Snellman sandy loam, 30 to 45 percent slopes	3,470	0.2
290	Rothsay silt loam	1,179	*
293B	Swenoda fine sandy loam, 1 to 4 percent slopes	1,276	*
335	Urness mucky silt loam	5,181	0.4
339	Fordville loam	8,073	0.6
341A	Arvilla sandy loam, 0 to 2 percent slopes	2,217	0.2
341B	Arvilla sandy loam, 2 to 6 percent slopes	13,905	1.0
371	Clontarf sandy loam	2,552	0.2
375	Forada loam	1,796	0.1
402C	Sioux loamy sand, 2 to 12 percent slopes	700	*
402E	Sioux loamy sand, 12 to 40 percent slopes	782	*
406A	Dorset sandy loam, 0 to 2 percent slopes	6,898	0.5
406B	Dorset sandy loam, 2 to 6 percent slopes	12,887	0.9
418	Lamoure silty clay loam, occasionally flooded	343	*
422B	Bygland silty clay loam, 1 to 6 percent slopes	5,832	0.4
422C	Bygland silty clay loam, 6 to 15 percent slopes	622	*
426	Foldahl loamy fine sand	525	*
441A	Almora loam, 0 to 2 percent slopes	1,704	0.1
441B	Almora loam, 2 to 6 percent slopes	5,181	0.4
441C	Almora loam, 6 to 12 percent slopes	1,332	*

See footnote at end of table.

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
481	Kratka fine sandy loam	635	*
494	Darnen loam, moderately wet	7,616	0.5
497	Hantho silt loam	1,535	0.1
508	Wyndmere fine sandy loam	192	*
540	Seelyeville muck	33,476	2.4
541	Rifle mucky peat	1,345	*
544	Cathro muck	15,960	1.1
567A	Verndale sandy loam, 0 to 2 percent slopes	5,374	0.4
567B	Verndale sandy loam, 2 to 6 percent slopes	562	*
609B	Dickey loamy fine sand, 1 to 5 percent slopes	489	*
624	Rosy sandy loam	17	*
646C	Peever clay loam, 6 to 12 percent slopes	4,001	0.3
646D	Peever clay loam, 12 to 18 percent slopes	1,505	0.1
670	Knute fine sandy loam	864	*
680	Parnell silt loam	8,411	0.6
698	Doran clay loam	1,031	*
701	Runeberg mucky loam, depressional	6,254	0.4
705B	Nitche-Kandota-Lida complex, 1 to 6 percent slopes	11,857	0.8
705C	Nitche-Kandota-Lida complex, 6 to 12 percent slopes	3,121	0.2
707B	Lizzie silt loam, 2 to 6 percent slopes	5,543	0.4
707C2	Lizzie silt loam, 6 to 12 percent slopes, eroded	1,637	0.1
707D2	Lizzie silt loam, 12 to 20 percent slopes, eroded	387	*
710	Friberg-Weetown complex	10,598	0.7
711B	Arvilla-Sandberg complex, 2 to 6 percent slopes	948	*
711C	Arvilla-Sandberg complex, 6 to 12 percent slopes	15,906	1.1
715	Bluffcreek-Clearriver complex	16,484	1.2
716B	Leaflake-Eagleview complex, 1 to 6 percent slopes	5,326	0.4
716C	Leaflake-Eagleview complex, 6 to 12 percent slopes	777	*
716D	Leaflake-Eagleview complex, 12 to 20 percent slopes	300	*
718E	Naytahwaush loam, 15 to 30 percent slopes	4,218	0.3
721B	Corliss loamy sand, 2 to 6 percent slopes	4,290	0.3
721C	Corliss loamy sand, 6 to 12 percent slopes	1,808	0.1
721D	Corliss loamy sand, 12 to 20 percent slopes	4,410	0.3
721E	Corliss loamy sand, 20 to 35 percent slopes	1,826	0.1
726	Kratka sandy loam, thick solum, depressional	1,824	0.1
746	Haslie muck	7,712	0.5
760C2	Chapett-Sisseton complex, 6 to 12 percent slopes, eroded	36,561	2.6
760D2	Chapett-Sisseton complex, 12 to 20 percent slopes, eroded	13,568	1.0
769B	Mehurin clay loam, 1 to 4 percent slopes	1,940	0.1
776B	Snellman-Sugarbush complex, 2 to 8 percent slopes	14	*
776C	Snellman-Sugarbush complex, 8 to 15 percent slopes	218	*
776E	Snellman-Sugarbush complex, 15 to 30 percent slopes	95	*
777C2	Sisseton-Heimdal complex, 6 to 12 percent slopes, eroded	12,508	0.9
777D2	Sisseton-Heimdal complex, 12 to 20 percent slopes, eroded	4,531	0.3
777E	Sisseton-Heimdal complex, 20 to 30 percent slopes	1,257	*
778B	Dorset-Corliss complex, 1 to 6 percent slopes	34,537	2.4
778C	Dorset-Corliss complex, 6 to 12 percent slopes	18,654	1.3
779B	Peever-Mehurin complex, 2 to 6 percent slopes	2,335	0.2
902B	Barnes-Buse complex, 2 to 6 percent slopes	17,599	1.2
903C2	Barnes-Langhei complex, 6 to 12 percent slopes, eroded	16,843	1.2
915C2	Forman-Buse complex, 6 to 12 percent slopes, eroded	15,159	1.1
915D2	Forman-Buse complex, 12 to 20 percent slopes, eroded	5,832	0.4
931C2	Formdale-Langhei complex, 6 to 12 percent slopes, eroded	6,218	0.4
931D2	Formdale-Langhei complex, 12 to 20 percent slopes, eroded	806	*
942D2	Langhei-Barnes complex, 12 to 20 percent slopes, eroded	4,627	0.3
957B2	Rothsay-Zell complex, 2 to 6 percent slopes, eroded	6,025	0.4
969C2	Zell-Rothsay complex, 6 to 12 percent slopes, eroded	7,447	0.5
969D2	Zell-Rothsay complex, 12 to 20 percent slopes, eroded	636	*
1015	Udipsamments (cut and fill land)	952	*
1016	Udorthents, loamy (cut and fill land)	2,699	0.2
1027	Udorthents, wet substratum (fill land)	461	*
1030	Pits, gravel-Udipsamments complex	1,770	0.1

See footnote at end of table.

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
1077	Forada and Leafriver soils, depressional	12,265	0.9
1102B	Chapett-Dorset complex, 1 to 6 percent slopes	1,621	0.1
1102C	Chapett-Dorset complex, 6 to 12 percent slopes, eroded	2,988	0.2
1103	Clitherall sandy loam	1,975	0.1
1104B	Waukon-Dorset complex, 1 to 6 percent slopes	755	*
1104C	Waukon-Dorset complex, 6 to 12 percent slopes, eroded	3,663	0.2
1104D	Waukon-Dorset complex, 12 to 20 percent slopes, eroded	2,193	0.2
1105B	Dent silt loam, 1 to 6 percent slopes	3,880	0.3
1110	Isan sandy loam	1,603	0.1
1111	Nidaros muck, frequently flooded	8,941	0.6
1112D	Chapett-Corliss complex, 12 to 20 percent slopes, eroded	3,133	0.2
1112E	Chapett-Corliss complex, 20 to 30 percent slopes	1,185	*
1113	Haslie, Seelyeville, and Cathro soils, ponded	17,671	1.2
1114	Hangaard loamy sand, lake beaches	758	*
1120	Rushlake-Hangaard complex	3,013	0.2
1129	Lindaas silty clay loam, morainic	865	*
1131B	Verndale-Abbeylake complex, 1 to 6 percent slopes	8,098	0.6
1136	Nidaros muck	19,340	1.4
1149	Hamerly clay loam	1,685	0.1
1195A	Sybil-Eagleview complex, 0 to 2 percent slopes	984	*
1195B	Sybil-Eagleview complex, 2 to 8 percent slopes	9,736	0.7
1195C	Sybil-Eagleview complex, 8 to 15 percent slopes	4,531	0.3
1195E	Sybil-Eagleview complex, 15 to 30 percent slopes	1,492	0.1
1196B	Lida-Two Inlets complex, 1 to 8 percent slopes	19,778	1.4
1196C	Lida-Two Inlets complex, 8 to 15 percent slopes	22,365	1.6
1196E	Lida-Two Inlets complex, 15 to 30 percent slopes	3,273	0.2
1196F	Lida-Two Inlets complex, 30 to 50 percent slopes	604	*
1200	Egglake loam	812	*
1208B	Naytahwaush-Mahkonce complex, 1 to 8 percent slopes	6,555	0.5
1209C	Naytahwaush clay loam, 8 to 15 percent slopes, eroded	8,170	0.6
1212B	Mahkonce clay loam, 1 to 4 percent slopes	1,958	0.1
1214	Mustinka silty clay loam	580	*
1215	Pinelake sandy loam	8,140	0.6
1216B	Egglake-Wykeham complex, 0 to 5 percent slopes	4,655	0.3
1217E	Waukon-Lida complex, 20 to 35 percent slopes	1,238	*
1218B	Snellman-Lida complex, 1 to 8 percent slopes	3,244	0.2
1218C	Snellman-Lida complex, 8 to 15 percent slopes	7,941	0.6
1218E	Snellman-Lida complex, 15 to 30 percent slopes	5,398	0.4
1218F	Snellman-Lida complex, 30 to 45 percent slopes	928	*
1219C	Sandberg-Sverdrup complex, 6 to 12 percent slopes	2,772	0.2
1221B	Sverdrup-Sandberg complex, 2 to 6 percent slopes	2,664	0.2
1223D	Sandberg-Arvilla complex, 12 to 20 percent slopes	4,386	0.3
1227	Quam, Cathro, and Urness soils, ponded	15,492	1.1
1230	Haslie and Nidaros soils, ponded	26,101	1.8
1232B	Chapett loam, 2 to 6 percent slopes	18,027	1.3
1232E	Chapett loam, 20 to 30 percent slopes	1,552	0.1
1234B	Formdale-Buse complex, 2 to 6 percent slopes	20,738	1.4
1237	Lakepark loam	7,037	0.5
1239	Quam silt loam	10,218	0.7
1240	Roliss clay loam	6,170	0.4
1247D	Corliss-Dorset complex, 12 to 20 percent slopes	4,965	0.3
1250C	Abbeylake-Verndale complex, 6 to 12 percent slopes	680	*
1259	Hamerly-Mustinka complex	2,085	0.1
1275B	Kandota-Egglake, depressional, complex, 0 to 8 percent slopes	2,236	0.2
1275C	Kandota-Egglake, depressional, complex, 0 to 15 percent slopes	1,674	0.1
1276	Knute-Brandsvold complex, thick solum	5,736	0.4
1277D	Corliss-Sverdrup complex, 12 to 20 percent slopes	822	*
1289	Knute fine sandy loam, thick solum	5,374	0.4
1290	Brandsvold fine sandy loam, thick solum	4,242	0.3
1291	Sedgeville loam, frequently flooded	1,107	*
1293	Sedgeville fine sandy loam, rarely flooded	744	*
1304A	Glyndon very fine sandy loam	278	*

See footnote at end of table.

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
1307	Rushlake sand	1,854	0.1
1317	Vallers silty clay loam	524	*
1319B	Rockwood sandy loam, 2 to 6 percent slopes, stony	10,484	0.7
1319C	Rockwood sandy loam, 6 to 12 percent slopes, stony	2,069	0.1
1319D	Rockwood sandy loam, 12 to 20 percent slopes, stony	503	*
1320B	Blowers sandy loam, 1 to 5 percent slopes, stony	35,777	2.5
1321	Paddock-Becida complex, stony	23,196	1.6
1322	Wolverton very fine sandy loam	813	*
1324B	Heimdal-Sisseton complex, 2 to 6 percent slopes	8,025	0.6
1338	Oakcreek loam	1,557	0.1
1339	Borup mucky silt loam, depressional	345	*
1340	Bluffcreek-Epoufette complex	2,024	0.1
1341	Clitherall-Wykeham complex	5,061	0.4
1342	Pinelake, loamy substratum-Brandsvold complex	4,025	0.3
1343C	Lida-Almora-Lizzie complex, 8 to 15 percent slopes	1,332	*
1344B	Lida-Almora-Dent complex, 1 to 8 percent slopes	3,374	0.2
1345	Bluffcreek-Rosy complex	748	*
1346	Nidaros muck, calcareous	7,326	0.5
1347B	Kandota loam, 1 to 6 percent slopes	5,097	0.4
1348	Knute loam, thick solum	3,555	0.2
1349	Clotho loam, moderately permeable	300	*
1350	Brandsvold loam, thick solum	868	*
1351	Bluffton loam, moderately permeable	4,643	0.3
1356	Water, miscellaneous	177	*
1365	Hillview fine sandy loam	1,135	*
1396	Sedgeville, Nidaros, and Aquolls soils, channeled	1,757	0.1
1397	Bemidji loamy sand, moderately permeable	698	*
1825B	Seelyeville muck, seep land, 1 to 10 percent slopes	749	*
1874	Radium loamy sand	578	*
1943	Roscommon loamy sand	1,046	*
1975	Oylen sandy loam	11,303	0.8
W	Water	233,212	16.4
	Total	1,423,300	100.0

* Less than 0.1 percent.

Soil Series and Detailed Soil Map Units

In this section, arranged in alphabetical order, each soil series recognized in the survey area is described. Each series description is followed by descriptions of the associated detailed soil map units.

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (USDA, 1993). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (USDA, 1999). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units 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. More information about each map unit is given in Part II of this survey.

A map unit delineation on the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas 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 “included” areas that belong to other taxonomic classes.

Most included 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, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. 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 included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas 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 included areas 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 segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, 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. The principal hazards and limitations to be considered in planning for specific uses are described in Part II of this survey.

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

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on

the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Waukon loam, 2 to 6 percent slopes, is a phase of the Waukon series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or undifferentiated groups.

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. Arvilla-Sandberg complex, 2 to 6 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Haslie, Seelyeville, and Cathro soils, ponded, is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. The Pits component of the map unit Pits, gravel-Udipsamments complex is an example.

The table “Acreage and Proportionate Extent of the Soils” in Parts I and II of this survey gives the acreage and proportionate extent of each map unit. Other tables (see Contents) 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.

Aazdahl Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate; lower part—moderately slow
Landform: Moraines
Parent material: Till
Slope range: 0 to 3 percent
Taxonomic classification: Fine-loamy, mixed Aquic Haploborolls

Typical Pedon

Aazdahl clay loam, 375 feet west and 2,300 feet north of the southeast corner of sec. 36, T. 132 N., R. 44 W.

Ap—0 to 8 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure parting to weak fine granular; friable; many fine roots; about 2 percent gravel; neutral; abrupt smooth boundary.

A—8 to 13 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure parting to weak fine granular; friable; many fine roots; about 2 percent gravel; neutral; clear smooth boundary.

Bw1—13 to 18 inches; brown (10YR 4/3) clay loam; moderate fine subangular blocky structure; friable; few fine roots; about 3 percent gravel; neutral; clear wavy boundary.

Bw2—18 to 23 inches; olive brown (2.5Y 4/4) clay loam; weak fine subangular blocky structure; friable; few fine roots; few medium prominent yellowish brown (10YR 5/6) Fe concentrations and common fine distinct dark grayish brown (2.5Y 4/2) Fe depletions; about 2 percent gravel; neutral; clear wavy boundary.

Bk—23 to 36 inches; light olive brown (2.5Y 5/4) clay loam; weak medium subangular blocky structure; friable; common fine angular light gray (10YR 7/2) soft masses of carbonates; common fine distinct grayish brown (2.5Y 5/2) Fe depletions and medium prominent yellowish brown (10YR 5/6) Fe concentrations; about 2 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

C—36 to 60 inches; light olive brown (2.5Y 5/4) clay loam; massive; friable; common medium prominent olive gray (5Y 5/2) Fe depletions and common fine prominent yellowish brown (10YR 5/6) Fe concentrations; about 2 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 14 to 27 inches
Thickness of the mollic epipedon: 10 to 16 inches
Content of rock fragments: 2 to 8 percent throughout

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—clay loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—2 to 4
Texture—clay loam or silty clay loam

Bk horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—2 to 4
Texture—clay loam, silty clay loam, or loam

C horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—2 to 6
Texture—clay loam, loam, or silty clay loam

26—Aazdahl clay loam

Composition

Aazdahl and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and rises on moraines
Position on the landform: Toeslopes
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 9.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Formdale and similar soils
- Very poorly drained soils
- Buse and similar soils
- Soils that have a silty surface layer

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Abbeylake Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 1 to 12 percent
Taxonomic classification: Mixed, frigid Typic Udipsamments

Typical Pedon

Abbeylake loamy sand, in an area of Verndale-Abbeylake complex, 1 to 6 percent slopes, 720 feet east and 2,190 feet north of the southwest corner of sec. 1, T. 135 N., R. 39 W.

Ap—0 to 8 inches; dark brown (10YR 3/3) loamy sand, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots; about 1 percent gravel; neutral; abrupt smooth boundary.
Bw—8 to 19 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; common very fine and fine roots; about 1 percent gravel; neutral; clear wavy boundary.
C1—19 to 27 inches; brown (10YR 5/3) sand; single grain; loose; common very fine and fine roots; strongly effervescent; moderately alkaline; gradual wavy boundary.
C2—27 to 60 inches; pale brown (10YR 6/3) sand; single grain; loose; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 15 to 40 inches
Content of rock fragments: 0 to 15 percent throughout

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—loamy sand or loamy coarse sand

Bw horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—3 or 4
Texture—sand, loamy sand, coarse sand, or loamy coarse sand

C horizon:
Hue—10YR

Value—5 or 6
Chroma—3 or 4
Texture—sand or coarse sand

1250C—Abbeylake-Verndale complex, 6 to 12 percent slopes

Composition

Abbeylake and similar soils: About 60 percent
Verndale and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Abbeylake

Texture of the surface layer: Loamy coarse sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.9 inches
Organic matter content: Moderate

Verndale

Texture of the surface layer: Coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.6 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Oylen and similar soils
- Pinelake and similar soils
- Forada and similar soils
- Nidaros and similar soils
- Areas that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Almora Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderate or moderately rapid; next part—moderately slow or moderate; lower part—rapid
Landforms: Kame moraines and pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 15 percent
Taxonomic classification: Fine-loamy over sandy or sandy-skeletal, mixed Boralfic Udic Argiborolls

Typical Pedon

Almora loam, 0 to 2 percent slopes, 1,175 feet west and 1,800 feet south of the northeast corner of sec. 16, T. 136 N., R. 40 W.

Ap—0 to 11 inches; black (10YR 2/1) loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; friable; many very fine and fine roots; very dark gray (10YR 3/1) organic coatings on faces of peds; about 1 percent gravel; slightly acid; abrupt smooth boundary.

BE—11 to 15 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 5/3) dry; moderate fine and medium subangular blocky structure; friable; very dark grayish brown (10YR 3/2) organic coatings and clay coatings on faces of peds; common very fine and fine roots; many continuous distinct light gray (10YR 7/2) very fine sand coatings on faces of peds; about 1 percent gravel; neutral; clear smooth boundary.

Bt1—15 to 35 inches; dark yellowish brown (10YR 4/4) sandy clay loam; moderate medium and coarse subangular blocky structure; friable; few very fine and fine roots; common discontinuous faint dark brown (10YR 3/3) clay films on faces of peds and in pores; about 5 percent gravel; neutral; clear wavy boundary.

Bt2—35 to 38 inches; dark brown (10YR 4/3) gravelly sandy clay loam; weak medium and coarse subangular blocky structure; friable; few very fine

and fine roots; many continuous distinct very dark grayish brown (7.5YR 3/2) clay films between sand grains and on faces of peds and in pores; about 20 percent gravel; neutral; clear wavy boundary.

2Bt3—38 to 46 inches; dark brown (10YR 3/3) gravelly loamy coarse sand; weak coarse subangular blocky structure; very friable; few very fine and fine roots; many discontinuous faint very dark grayish brown (10YR 3/2) clay films and clay bridging on sand and gravel; about 25 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

2C1—46 to 52 inches; yellowish brown (10YR 5/4) gravelly coarse sand; single grain; loose; about 35 percent gravel; slightly effervescent; slightly alkaline; gradual wavy boundary.

2C2—52 to 80 inches; light yellowish brown (10YR 6/4) very gravelly coarse sand; single grain; loose; about 50 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 24 to more than 60 inches
Thickness of the mollic epipedon: 8 to 16 inches
Content of rock fragments: 1 to 10 percent in the A and E horizons; 1 to 25 percent in the Bt horizon; 1 to 55 percent, by volume, in the 2B and 2C horizons
Thickness of the loamy mantle: 24 to 40 inches

Ap or A horizon:
Hue—10YR or 7.5YR
Value—2 or 3
Chroma—1 to 3
Texture—loam, sandy loam, or fine sandy loam
Content of rock fragments—1 to 10 percent

BE horizon:
Hue—10YR
Value—3 to 5
Chroma—2 to 4
Texture—loam, fine sandy loam, or sandy loam
Content of rock fragments—1 to 10 percent

Bt horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—3 or 4
Texture—loam, clay loam, sandy clay loam, silt loam, fine sandy loam, or sandy loam or the gravelly analogs of these textures
Content of rock fragments—1 to 25 percent

2Bt horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—3 to 5
Texture—coarse sand, sand, loamy coarse sand, or loamy sand or the gravelly or very gravelly analogs of these textures
Content of rock fragments—1 to 55 percent

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 7
Chroma—2 to 4
Texture—sand, coarse sand, or the gravelly analogs of these textures or stratified fine sand, loamy fine sand, fine sandy loam, very fine sandy loam, or loam
Content of rock fragments—1 to 55 percent

441A—Almora loam, 0 to 2 percent slopes

Composition

Almora and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flats and swales on pitted outwash plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 7.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Dorset and similar soils
- Oakcreek and similar soils
- Pinelake and similar soils
- Lida and similar soils
- Areas that have slopes of more than 2 percent

Major Uses of the Unit

- Cropland
- Hayland

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

441B—Almora loam, 2 to 6 percent slopes

Composition

Almora and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.3 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Dorset and similar soils
- Oakcreek and similar soils
- Pinelake and similar soils
- Lida and similar soils
- Areas that have slopes of more than 6 percent or less than 2 percent
- Corliss and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

441C—Almora loam, 6 to 12 percent slopes

Composition

Almora and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 7.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Dorset and similar soils
- Oakcreek and similar soils
- Pinelake and similar soils
- Lida and similar soils
- Areas that have slopes of more than 12 percent or less than 6 percent
- Corliss and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Arveson Series

Depth class: Very deep
Drainage class: Poorly drained and very poorly drained
Permeability: Upper part—moderate or moderately rapid; lower part—rapid
Landforms: Lake plains and outwash plains
Parent material: Glaciolacustrine deposits or glacial outwash
Slope range: 0 to 1 percent
Taxonomic classification: Coarse-loamy, frigid Typic Calciaquolls

Typical Pedon

Arveson loam, 100 feet west and 1,800 feet north of the southeast corner of sec. 8, T. 132 N., R. 44 W.

Ap—0 to 10 inches; black (N 2/0) loam, dark gray (N 4/0) dry; moderate medium subangular blocky structure; very friable; common fine and very fine roots; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Bkg1—10 to 15 inches; very dark gray (5Y 3/1) fine sandy loam; weak medium subangular blocky structure; very friable; common fine and very fine roots; common distinct light gray (5Y 7/1) carbonate coatings on faces of peds; violently effervescent; moderately alkaline; clear wavy boundary.

Bkg2—15 to 30 inches; dark gray (5Y 4/1) fine sandy loam; weak medium subangular blocky structure; very friable; few very fine roots; common faint gray (5Y 5/1) carbonate coatings on faces of peds; violently effervescent; moderately alkaline; clear wavy boundary.

2Cg—30 to 60 inches; light olive gray (5Y 6/2) fine sand; few fine prominent light olive brown (2.5Y 5/4) Fe concentrations; single grain; loose; strongly effervescent; moderately alkaline.

Range in Characteristics

Carbonates: At or near the surface
Thickness of the mollic epipedon: 7 to 24 inches
Thickness of the loamy mantle: 20 to 60 inches
Content of rock fragments: 0 to 1 percent throughout

Ap or A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—loam

Bkg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 7
Chroma—0 to 2
Texture—sandy loam, fine sandy loam, sandy clay loam, loam, or clay loam

2Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—coarse sand, sand, fine sand, loamy sand, or loamy fine sand

61—Arveson loam

Composition

Arveson and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on lake plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits or glacial outwash
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 7.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Rockwell and similar soils
- Soils that are underlain by loamy till
- Soils in which carbonates have been leached
- Very poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

68—Arveson loam, depressional

Composition

Arveson and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landforms: Depressions on lake plains and outwash plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Glaciolacustrine deposits or glacial outwash
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 7.5 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Haug and similar soils
- Soils that are underlain by loamy till
- Soils in which carbonates have been leached
- Soils that have loamy layers in the substratum
- Nidaros and similar soils
- Poorly drained soils

Major Uses of the Unit

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Arvilla Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Upper part—moderately rapid; lower part—rapid or very rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 20 percent
Taxonomic classification: Sandy, mixed Udic Haploborolls

Typical Pedon

Arvilla sandy loam, 2 to 6 percent slopes, 150 feet east and 1,800 feet south of the northwest corner of sec. 10, T. 133 N., R. 40 W.

Ap—0 to 9 inches; black (10YR 2/1) sandy loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; very friable; about 2 percent gravel; many very fine and fine roots; neutral; abrupt smooth boundary.

Bw1—9 to 14 inches; very dark grayish brown (10YR 3/2) sandy loam, brown (10YR 4/3) dry; moderate medium subangular blocky structure; very friable; about 2 percent gravel; common very fine and fine roots; neutral; clear smooth boundary.

Bw2—14 to 19 inches; dark brown (10YR 3/3) sandy loam, dark yellowish brown (10YR 4/4) dry; weak fine and medium subangular blocky structure; very friable; about 5 percent gravel; common very fine and fine roots; neutral; clear smooth boundary.

2Bk—19 to 30 inches; brown (10YR 4/3) sand; single grain; loose; common light gray (10YR 7/2) carbonate coatings on the underside of sand grains and pebbles; about 10 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

2C—30 to 60 inches; light olive brown (2.5Y 5/4) gravelly sand; single grain; loose; about 15 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 13 to 25 inches
Thickness of the mollic epipedon: 7 to 20 inches
Thickness of the loamy mantle: 14 to 25 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam
Content of rock fragments—0 to 10 percent

Bw horizon:
Hue—2.5Y, 10YR, or 7.5YR
Value—2 to 5
Chroma—1 to 4
Texture—sandy loam, coarse sandy loam, loam, or fine sandy loam
Content of rock fragments—0 to 10 percent

2Bk horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—1 to 4
Texture—sand, coarse sand, or the gravelly or very gravelly analogs of these textures
Content of rock fragments—5 to 60 percent

2C horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—2 to 6
Texture—sand, coarse sand, loamy sand, loamy coarse sand, or the gravelly analogs of these textures
Content of rock fragments—5 to 35 percent

341A—Arvilla sandy loam, 0 to 2 percent slopes

Composition

Arvilla and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flats on outwash plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Sandberg and similar soils
- Fordville and similar soils
- Oylen and similar soils
- Areas that have slopes of more than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

341B—Arvilla sandy loam, 2 to 6 percent slopes

Composition

Arvilla and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.9 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Sandberg and similar soils
- Fordville and similar soils
- Oylen and similar soils
- Forada and similar soils
- Areas that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

711B—Arvilla-Sandberg complex, 2 to 6 percent slopes

Composition

Arvilla and similar soils: About 65 percent
Sandberg and similar soils: About 25 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Arvilla

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Moderate

Sandberg

Texture of the surface layer: Coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.8 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Oylen and similar soils
- Fordville and similar soils
- Forada and similar soils
- Leafriver and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

711C—Arvilla-Sandberg complex, 6 to 12 percent slopes

Composition

Arvilla and similar soils: About 50 percent
Sandberg and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Arvilla

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.6 inches
Organic matter content: Moderate

Sandberg

Texture of the surface layer: Coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Oylen and similar soils
- Fordville and similar soils
- Forada and similar soils
- Leafriver and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Barnes Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Moraines
Parent material: Till
Slope range: 2 to 20 percent
Taxonomic classification: Fine-loamy, mixed Udic Haploborolls

Typical Pedon

Barnes loam, in an area of Barnes-Buse complex, 2 to 6 percent slopes, 1,000 feet south and 200 feet east of the northwest corner of sec. 20, T. 136 N., R. 44 W.

Ap—0 to 9 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; friable; common medium roots; about 3 percent gravel; neutral; abrupt smooth boundary.

Bw—9 to 17 inches; brown (10YR 4/3) loam; moderate medium subangular blocky structure; friable; common fine roots; very few faint dark brown (10YR 3/3) discontinuous organic coatings on faces of peds; about 3 percent gravel; neutral; clear wavy boundary.

Bk—17 to 36 inches; brown (10YR 5/3) loam; weak fine subangular blocky structure; friable; few fine roots; common fine angular light gray (10YR 7/2) carbonate nodules; about 4 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

C—36 to 60 inches; light olive brown (2.5Y 5/4) loam; massive; friable; few fine angular light gray (10YR 7/2) carbonate nodules; about 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 8 to 31 inches
Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: 1 to 10 percent throughout

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—loam

Bw horizon:
Hue—10YR or 2.5Y
Value—2 to 5
Chroma—2 to 4
Texture—loam or clay loam

Bk horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—2 to 4
Texture—loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loam

902B—Barnes-Buse complex, 2 to 6 percent slopes

Composition

Barnes and similar soils: About 60 percent
Buse and similar soils: About 25 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: Barnes—2 to 6 percent; Buse—3 to 6 percent

Component Description

Barnes

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.3 inches
Organic matter content: Moderate

Buse

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lakepark and similar soils
- Quam and similar soils
- Parnell and similar soils
- Roliss and similar soils
- Darnen and similar soils
- Hamerly and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

903C2—Barnes-Langhei complex, 6 to 12 percent slopes, eroded

Composition

Barnes and similar soils: About 55 percent
Langhei and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Barnes

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.4 inches
Organic matter content: Moderate

Langhei

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.4 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lakepark and similar soils
- Quam and similar soils
- Parnell and similar soils
- Roliss and similar soils
- Darnen and similar soils
- Hamerly and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Becida Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderate; next part—slow; lower part—very slow
Landform: Drumlins
Parent material: Till
Slope range: 0 to 2 percent
Taxonomic classification: Coarse-loamy, mixed, frigid Mollic Glossaqualfs

Typical Pedon

Becida loam, in an area of Paddock-Becida complex, stony, 2,600 feet west and 400 feet south of the northeast corner of sec. 21, T. 136 N., R. 36 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) loam,

dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; friable; common fine and very fine roots; about 1 percent gravel; slightly acid; abrupt smooth boundary.

Eg—8 to 13 inches; dark grayish brown (10YR 4/2) fine sandy loam, very pale brown (10YR 7/3) dry; strong thick platy structure; very friable; common fine prominent dark reddish brown (5YR 3/3) and common fine and medium prominent brown (7.5YR 4/4) Fe concentrations; few very fine roots; about 1 percent gravel; moderately acid; clear wavy boundary.

E/B—13 to 27 inches; 70 percent grayish brown (2.5Y 5/2) sandy loam (Eg) and 30 percent brown (10YR 4/3) sandy loam (Bt); weak medium subangular blocky structure; friable; common fine and medium prominent yellowish red (5YR 5/8 and 4/6) Fe concentrations; common patchy faint gray (10YR 5/1) clay films on faces of peds; few fine roots; about 3 percent gravel; moderately acid; clear wavy boundary.

Btg—27 to 34 inches; grayish brown (2.5Y 5/2) sandy loam; moderate medium subangular blocky structure; friable; common fine and medium distinct strong brown (7.5YR 5/6) and common fine yellowish red (5YR 4/6) Fe concentrations; common patchy faint gray (10YR 5/1) and dark brown (10YR 4/3) clay films on faces of peds; about 2 percent gravel; moderately acid; clear wavy boundary.

Bt1—34 to 49 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate coarse subangular blocky structure; friable; many medium and coarse prominent strong brown (7.5YR 4/6) Fe concentrations and common fine distinct light brownish gray (10YR 6/2) Fe depletions; few patchy faint dark grayish brown (10YR 4/2) clay films on faces of peds; few patchy prominent very dark grayish brown (10YR 3/2) iron-manganese stains in pores and on faces of peds; about 7 percent gravel; slightly acid; clear wavy boundary.

Bt2—49 to 58 inches; yellowish brown (10YR 5/4) sandy loam; weak coarse subangular blocky structure; friable; few fine and medium distinct light olive brown (2.5Y 5/3) Fe depletions; few patchy distinct very dark grayish brown (10YR 3/2) and common discontinuous dark yellowish brown (10YR 4/4) clay films in pores and on faces of peds; about 5 percent gravel; slightly acid; clear wavy boundary.

BCd—58 to 80 inches; light olive brown (2.5Y 5/3) sandy loam; massive breaking to moderate platy soil fragments; firm; common medium prominent yellowish brown (10YR 5/6) Fe concentrations and many medium and coarse distinct light brownish gray (2.5Y 6/2) Fe depletions; about 5 percent gravel; neutral.

Range in Characteristics

Depth to carbonates: 40 to more than 60 inches
Depth to dense till: 40 to 60 inches
Combined thickness of the Bt horizon: 14 to 40 inches
Content of rock fragments: 2 to 15 percent gravel; 0 to 3 percent cobbles

A or Ap horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam
Content of rock fragments—2 to 15 percent gravel; 0 to 3 percent cobbles

E or Eg horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 or 2
Texture—sandy loam, fine sandy loam, or loamy sand
Content of rock fragments—2 to 15 percent gravel; 0 to 3 percent cobbles

EB, E/B, B/E, or BE horizon:
Colors—similar to those of the E and Bt horizons
Textures—similar to those of the E and Bt horizons

Bt horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 (upper part); 2 to 4 (lower part)
Texture—dominantly sandy loam or fine sandy loam; subhorizons of loam or sandy clay loam in some pedons
Content of rock fragments—2 to 15 percent gravel; 0 to 3 percent cobbles

Cd horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—3 to 6
Texture—dominantly sandy loam or fine sandy loam; subhorizons of loamy sand in some pedons
Content of rock fragments—2 to 15 percent gravel; 0 to 3 percent cobbles

Bemidji Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—rapid; lower part—moderate
Landform: Moraines
Parent material: Eolian deposits over till
Slope range: 1 to 3 percent
Taxonomic classification: Loamy, mixed Aquic Arenic Eutroboralfs

Typical Pedon

Bemidji loamy sand, moderately permeable, 1,700 feet east and 175 feet north of the southwest corner of sec. 33, T. 136 N., R. 38 W.

Ap—0 to 8 inches; dark brown (10YR 3/3) loamy sand, pale brown (10YR 6/3) dry; weak very fine subangular blocky structure; very friable; common fine roots; moderately acid; abrupt smooth boundary.

E—8 to 29 inches; brown (10YR 4/3) sand, pale brown (10YR 6/3) dry; single grain; loose; few fine roots; slightly acid; clear smooth boundary.

Bt1—29 to 33 inches; yellowish brown (10YR 4/4) sand; single grain; loose; few fine roots; common patchy prominent brown (7.5YR 4/3) clay bridging between sand grains; common coarse prominent brown (7.5YR 4/4) and light brownish gray (2.5Y 6/2) and common distinct dark yellowish brown (10YR 4/4) Fe depletions; few fine rounded iron-manganese concretions; slightly acid; clear smooth boundary.

Bt2—33 to 36 inches; brown (7.5YR 4/4) loamy sand; weak medium and thick platy structure; very friable; few fine roots; many continuous distinct dark brown (7.5YR 3/2) clay films on faces of peds; slightly acid; clear smooth boundary.

2Bt3—36 to 45 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium and coarse subangular blocky structure; friable; few very fine roots; common discontinuous distinct brown (7.5YR 4/3) clay films on faces of peds; common medium and coarse prominent light brownish gray (2.5Y 6/2) and distinct dark grayish brown (10YR 4/2) Fe depletions; common irregular medium soft masses of iron-manganese; about 5 percent gravel; slightly acid; clear smooth boundary.

2Bt4—45 to 60 inches; dark yellowish brown (10YR 4/4) sandy clay loam; moderate medium and coarse subangular blocky structure; friable; few very fine roots; common discontinuous distinct brown (7.5YR 4/3) clay films on faces of peds and few patchy distinct dark grayish brown (10YR 4/2) clay films in root channels or pores; many medium and coarse distinct grayish brown (10YR 5/2) Fe depletions; about 5 percent gravel; slightly acid.

Range in Characteristics

Depth to carbonates: 30 to more than 60 inches
Content of rock fragments: 0 to 35 percent in the sandy mantle and 5 to 15 percent in the glacial till
Thickness of the sandy mantle: 20 to 40 inches

Ap or A horizon:
Hue—10YR
Value—2 to 4
Chroma—1 to 3
Texture—loamy sand

E horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—fine sand, sand, or loamy sand or the gravelly analogs of these textures

Bt horizon:
Hue—10YR or 7.5YR
Value—2 to 5
Chroma—3 to 6
Texture—sand or loamy sand

2Bt horizon:
Hue—10YR or 2.5Y
Value—2 to 5
Chroma—3 to 5
Texture—sandy clay loam, sandy loam, fine sandy loam, or loam

1397—Bemidji loamy sand, moderately permeable

Composition

Bemidji and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Footslopes and toeslopes
Slope range: 1 to 3 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Eolian deposits over till
Flooding: None

Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.6 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Kandota and similar soils
- Bluffton and similar soils
- Kratka and similar soils
- Leaflake and similar soils
- Brandsvold and similar soils
- Soils in which the till is closer to the surface or at a greater depth than in the Bemidji soil

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Blowers Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate; next part—moderately slow; lower part—very slow
Landform: Drumlins
Parent material: Till
Slope range: 1 to 5 percent
Taxonomic classification: Coarse-loamy, mixed Glossaquic Eutroboralfs

Typical Pedon

Blowers sandy loam, 1 to 5 percent slopes, stony, 50 feet east and 2,625 feet north of the southwest corner of sec. 19, T. 136 N., R. 36 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) sandy loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; very friable; many very fine and fine roots; slightly acid; abrupt smooth boundary.

E—7 to 14 inches; brown (10YR 5/3) sandy loam, light gray (10YR 7/2) dry; moderate medium platy structure parting to weak very fine subangular blocky; very friable; common very fine and fine roots; about 3 percent gravel; slightly acid; clear smooth boundary.

E/B—14 to 19 inches; about 60 percent brown (10YR 5/3) loamy sand (E), about 40 percent brown (10YR 4/3) sandy loam (B); weak medium subangular blocky structure; very friable; few very fine roots; about 3 percent gravel; moderately acid; clear smooth boundary.

B/E—19 to 27 inches; about 75 percent brown (10YR 4/3) sandy loam (B), 25 percent brown (10YR 5/3) loamy sand (E); moderate medium subangular blocky structure; firm; few very fine roots; about 2 percent gravel; moderately acid; clear smooth boundary.

Bt—27 to 36 inches; light olive brown (2.5Y 5/4) sandy loam; moderate coarse subangular blocky structure; firm; few very fine roots; few distinct brown (10YR 4/3) and prominent dark grayish brown (10YR 4/2) clay films on faces of peds; few medium prominent brownish gray (10YR 5/2) and common coarse prominent yellowish red (5YR 4/6) Fe concentrations; few fine prominent light brownish gray (10YR 6/2) Fe depletions; about 2 percent gravel; moderately acid; clear smooth boundary.

BC—36 to 43 inches; light olive brown (2.5Y 5/4) sandy loam; moderate medium subangular blocky structure; firm; few very fine roots; few distinct brown (10YR 4/3) clay films on faces of peds; common fine distinct yellowish brown (2.5Y 5/6) Fe concentrations; about 3 percent gravel; neutral; clear smooth boundary.

Cd—43 to 60 inches; light yellowish brown (2.5Y 6/4) sandy loam; moderate thick platy soil fragments; firm; about 4 percent gravel; common distinct discontinuous light gray (10YR 7/2) carbonate coatings on faces of peds; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to dense till: 40 to 60 inches
Depth to carbonates: 32 to 60 inches
Content of rock fragments: 2 to 15 percent gravel; 0 to 3 percent cobbles

Ap or A horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam
Content of rock fragments—2 to 15 percent gravel; 0 to 3 percent cobbles

E horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 or 3
Texture—sandy loam or loamy sand
Content of rock fragments—2 to 15 percent gravel; 0 to 3 percent cobbles

EB, E/B, B/E, or BE horizon:
Colors—similar to those of the E and Bt horizons
Textures—similar to those of the E and Bt horizons

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—3 to 6
Texture—dominantly sandy loam; subhorizons of loam, fine sandy loam, or sandy clay loam in some pedons
Content of rock fragments—2 to 15 percent gravel; 0 to 3 percent cobbles

Cd horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 to 5
Texture—dominantly sandy loam; subhorizons of loamy sand in some pedons
Content of rock fragments—2 to 15 percent gravel; 0 to 3 percent cobbles

1320B—Blowers sandy loam, 1 to 5 percent slopes, stony

Composition

Blowers and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drumlins
Position on the landform: Summits and backslopes
Slope range: 1 to 5 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.0 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 6.3 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Becida and similar soils
- Runeberg and similar soils
- Paddock and similar soils
- Rockwood and similar soils
- Clitherall and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Bluffcreek Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderately rapid; lower part—rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 3 percent
Taxonomic classification: Coarse-loamy, mixed Oxyaquic Eutroboralfs

Typical Pedon

Bluffcreek sandy loam, in an area of Bluffcreek-Clearriver complex, 950 feet west and 50 feet south of the northeast corner of sec. 36, T. 136 N., R. 37 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) sandy loam, dark brown (10YR 4/3) dry; weak fine and medium granular structure; very friable; common very fine and fine roots; about 2 percent gravel; slightly acid; abrupt smooth boundary.

E1—8 to 14 inches; dark brown (10YR 4/3) loamy sand, light yellowish brown (10YR 6/4) dry; weak fine and medium subangular blocky structure; very friable; few very fine and fine roots; about 2 percent gravel; slightly acid; clear smooth boundary.

E2—14 to 26 inches; dark brown (10YR 4/3) sand, light yellowish brown (10YR 6/4) dry; single grain;

loose; about 10 percent gravel; slightly acid; clear wavy boundary.

E&Bt—26 to 34 inches; yellowish brown (10YR 5/4) sand (E); single grain; loose; lamellae of dark yellowish brown (10YR 4/4) sandy loam (Bt); weak very fine subangular blocky structure; very friable; lamellae are discontinuous and are 0.1 to 0.2 inch thick; about 8 percent gravel; moderately acid; clear smooth boundary.

Bt—34 to 42 inches; dark yellowish brown (10YR 4/4) coarse sandy loam; moderate medium and coarse subangular blocky structure; friable; many coarse distinct dark grayish brown (10YR 4/2) Fe depletions and common medium prominent strong brown (7.5YR 5/8) Fe concentrations; many continuous prominent dark brown (7.5YR 3/2) clay films on faces of peds and in pores; 5 percent gravel; moderately acid; clear wavy boundary.

BC—42 to 50 inches; yellowish brown (10YR 5/4) sand; single grain; loose; about 3 percent gravel; slightly acid; clear wavy boundary.

C—50 to 80 inches; light brownish gray (10YR 6/2) sand; single grain; loose; common coarse distinct brownish yellow (10YR 6/8) Fe concentrations; about 5 percent gravel; slightly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 30 to 60 inches

Ap or A horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 to 3
- Texture—sandy loam
- Content of rock fragments—0 to 15 percent

E horizon:
- Hue—10YR
- Value—4 or 5
- Chroma—2 to 4
- Texture—loamy sand, sand, loamy fine sand, loamy coarse sand, or sandy loam
- Content of rock fragments—0 to 15 percent

E&Bt, EB, E/B, B/E, or BE horizon:
- Colors—similar to those of the E and Bt horizons
- Textures—similar to those of the E and Bt horizons

Bt horizon:
- Hue—7.5YR or 10YR
- Value—4 or 5
- Chroma—3 or 4
- Texture—dominantly sandy loam, coarse sandy loam, or the gravelly analogs of these textures; subhorizons of sandy clay loam, loam, loamy sand, or loamy coarse sand or the gravelly analogs of these textures in some pedons
- Content of rock fragments—0 to 35 percent

Bw horizon:
- Hue—10YR or 7.5YR
- Value—3 to 5
- Chroma—3 or 4
- Texture—loamy sand, loamy coarse sand, coarse sand, or sand or the gravelly analogs of these textures
- Content of rock fragments—0 to 35 percent

C horizon:
- Hue—10YR, 2.5Y, or 7.5YR
- Value—4 to 7
- Chroma—2 to 6
- Texture—sand, coarse sand, or the gravelly analogs of these textures
- Content of rock fragments—0 to 35 percent

715—Bluffcreek-Clearriver complex

Composition

Bluffcreek and similar soils: About 60 percent
Clearriver and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on pitted outwash plains
Slope range: 0 to 3 percent

Component Description

Bluffcreek

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.6 inches
Organic matter content: Moderate

Clearriver

Texture of the surface layer: Loamy coarse sand
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash
Flooding: None

Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 4.8 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lida and similar soils
- Epoufette and similar soils
- Nidaros and similar soils
- Very poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1340—Bluffcreek-Epoufette complex

Composition

Bluffcreek and similar soils: About 65 percent
Epoufette and similar soils: About 25 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Bluffcreek—flats and slight rises; Epoufette—flats and swales
Slope range: Bluffcreek—0 to 3 percent; Epoufette—0 to 2 percent

Component Description

Bluffcreek

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.3 inches
Organic matter content: Moderate

Epoufette

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 0.5 foot to 2.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lida and similar soils
- Nidaros and similar soils
- Forada and similar soils
- Soils that have a loamy substratum

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1345—Bluffcreek-Rosy complex

Composition

Bluffcreek and similar soils: About 60 percent
Rosy and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on pitted outwash plains
Slope range: 0 to 3 percent

Component Description

Bluffcreek

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash
Flooding: None

Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.2 inches
Organic matter content: Moderate

Rosy

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciofluvial deposits
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 9.6 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lida and similar soils
- Hillview and similar soils
- Epoufette and similar soils
- Nidaros and similar soils
- Leafriver and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Bluffton Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderate
Landform: Moraines
Parent material: Till
Slope range: 0 to 1 percent
Taxonomic classification: Fine-loamy, mixed, frigid Typic Endoaquolls

Typical Pedon

Bluffton loam, moderately permeable, 500 feet south and 1,100 feet west of the northeast corner of sec. 25, T. 137 N., R. 38 W.

A1—0 to 7 inches; black (N 2/0) loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; common fine roots; neutral; clear smooth boundary.

A2—7 to 10 inches; very dark grayish brown (2.5Y 3/2) loam, grayish brown (10YR 5/2) dry; weak medium platy structure; friable; common fine roots; few fine prominent brown (7.5YR 4/4) Fe concentrations; about 1 percent gravel; neutral; clear smooth boundary.

Bg1—10 to 15 inches; dark grayish brown (2.5Y 4/2) sandy clay loam; moderate medium subangular blocky structure; friable; few fine roots; few fine prominent brown (7.5YR 4/4) Fe concentrations; about 4 percent gravel; neutral; clear smooth boundary.

Bg2—15 to 29 inches; light olive brown (2.5Y 5/3) loam; weak fine subangular blocky structure; friable; few fine roots; common fine prominent strong brown (7.5YR 4/6) Fe concentrations; about 4 percent gravel; neutral; clear smooth boundary.

Bg3—29 to 53 inches; olive (5Y 5/3) loam; weak fine subangular blocky structure; friable; common medium prominent strong brown (7.5YR 4/6) Fe concentrations; about 5 percent gravel; neutral; clear smooth boundary.

Cg—53 to 80 inches; olive (5Y 5/3) loam; massive; friable; common medium prominent dark yellowish brown (10YR 4/6) Fe concentrations; about 5 percent gravel; neutral.

Range in Characteristics

Depth to carbonates: 40 to more than 60 inches
Thickness of the mollic epipedon: 7 to 24 inches
Content of rock fragments: 1 to 10 percent throughout

A1 horizon:
Hue—10YR to 5Y or neutral
Value—2 or 3
Chroma—0 to 2
Texture—mucky loam or loam

A2 horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—sandy loam, sandy clay loam, or loam

Bg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 to 3

Texture—fine sandy loam, sandy clay loam, clay loam, or loam

Cg horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—1 to 3
Texture—fine sandy loam, sandy clay loam, or loam

1351—Bluffton loam, moderately permeable

Composition

Bluffton and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Depressions on moraines
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Till
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 10.3 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Kandota and similar soils
- Knute and similar soils
- Kratka and similar soils
- Brandsvold and similar soils
- Cathro and similar soils
- Clotho and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Borup Series

Depth class: Very deep
Drainage class: Poorly drained and very poorly drained
Permeability: Upper part—moderately rapid; lower part—moderately rapid or rapid
Landform: Lake plains and outwash plains
Parent material: Glaciolacustrine deposits
Slope range: 0 to 1 percent
Taxonomic classification: Coarse-silty, frigid Typic Calciaquolls

Typical Pedon

Borup loam, 220 feet north and 1,850 feet east of the southwest corner of sec. 29, T. 136 N., R. 43 W.

Ap—0 to 8 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; many fine roots; strongly effervescent; slightly alkaline; gradual wavy boundary.

Ak—8 to 13 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate very fine granular structure; very friable; common fine roots; many fine light gray (10YR 7/2) carbonate threads; violently effervescent; moderately alkaline; gradual wavy boundary.

Bkg1—13 to 22 inches; grayish brown (2.5Y 5/2) silt loam; weak very fine subangular blocky structure; very friable; common fine roots; few medium distinct light olive brown (2.5Y 5/6) Fe concentrations; many fine light gray (10YR 7/2) masses of carbonates; violently effervescent; slightly alkaline; clear wavy boundary.

Bkg2—22 to 32 inches; grayish brown (2.5Y 5/2) very fine sandy loam; weak thin platy structure parting to weak very fine subangular blocky; very friable; few fine roots; many medium prominent dark yellowish brown (10YR 4/6) and many medium prominent strong brown (7.5YR 5/8) Fe concentrations; common fine rounded light gray (10YR 7/2) soft masses of carbonates; strongly effervescent; slightly alkaline; gradual wavy boundary.

Cg—32 to 60 inches; olive gray (5Y 5/2) very fine sandy loam; few very fine roots; many coarse

prominent strong brown (7.5YR 4/6 and 5/8) Fe concentrations; slightly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: At or near the surface
Thickness of the mollic epipedon: 7 to 20 inches
Content of rock fragments: Typically none throughout

Ap or A horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—loam

Ak horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silt loam, very fine sandy loam, loam, or sandy clay loam

Bkg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silt loam, loamy very fine sand, very fine sandy loam, loam, or sandy clay loam

Cg horizon:
Hue—2.5Y, 5Y, or neutral
Value—4 to 6
Chroma—0 to 3
Texture—very fine sandy loam, very fine sand, loamy very fine sand, loam, or silt loam

46—Borup loam

Composition

Borup and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landforms: Flats and swales on lake plains and outwash plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 11.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Glyndon and similar soils
- Very poorly drained soils
- Soils that have more clay in the subsoil than the Borup soil
- Hillview and similar soils
- Soils that have a leached subsoil
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1339—Borup mucky silt loam, depressional

Composition

Borup and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landforms: Depressions on lake plains and outwash plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Mucky silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Glyndon and similar soils
- Poorly drained soils
- Soil that have more clay in the subsoil than the Borup soil
- Hillview and similar soils
- Soils that have a leached subsoil
- Cathro and similar soils

Major Uses of the Unit

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Brandsvold Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderate or moderately rapid; next part—moderate; lower part—moderately slow
Landform: Moraines
Parent material: Till
Slope range: 0 to 2 percent
Taxonomic classification: Fine-loamy, mixed, frigid Typic Argiaquolls

Typical Pedon

Brandsvold fine sandy loam, thick solum, 750 feet south and 800 feet east of the northwest corner of sec. 17, T. 133 N., R. 37 W.

Ap—0 to 12 inches; black (10YR 2/1) fine sandy loam, dark grayish brown (10YR 3/2) dry; moderate fine and medium subangular blocky structure; friable; many very fine and fine and common medium roots; about 1 percent gravel; slightly acid; abrupt smooth boundary.

Eg—12 to 17 inches; dark grayish brown (10YR 4/2) sandy loam; moderate medium subangular blocky structure; friable; common very fine roots; common dark gray (10YR 4/1) clay films on faces of peds; common fine prominent dark reddish brown (5YR 3/2) and many medium distinct brown (7.5YR 4/3) Fe concentrations; about 2 percent gravel; slightly acid; gradual wavy boundary.

Btg1—17 to 37 inches; grayish brown (2.5Y 5/2) sandy clay loam; moderate medium subangular blocky structure; friable; common very fine roots; common continuous distinct dark grayish brown (10YR 4/2) clay films on faces of peds; many fine and medium prominent brown (7.5YR 4/4) and common fine prominent reddish brown (5YR 4/4) Fe concentrations; about 10 percent gravel; slightly acid; clear smooth boundary.

Btg2—37 to 45 inches; light brownish gray (2.5Y 6/2) sandy loam; weak medium and coarse subangular blocky structure; friable; few very fine roots; few patchy prominent dark gray (10YR 4/1) clay films in root channels or pores; common medium prominent brown (7.5YR 4/4) and many medium and coarse prominent yellowish brown (10YR 5/6) Fe concentrations; about 5 percent gravel; neutral; clear smooth boundary.

C—45 to 60 inches; light olive brown (2.5Y 5/4) sandy loam; plate-like soil fragments; friable; common fine faint light olive brown (2.5Y 5/3) Fe depletions and common fine prominent yellowish brown (10YR 5/6) Fe concentrations; about 5 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 26 to more than 60 inches
Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: 2 to 12 percent gravel
Other features: Some pedons have an E horizon, which is 2 to 6 inches thick.

Ap or A horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—fine sandy loam

Btg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 6
Chroma—0 to 3
Texture—loam, sandy clay loam, or clay loam

Bk horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—loam, sandy loam, or fine sandy loam

C horizon:
Hue—2.5Y or 5Y
Value—4 to 6

Chroma—1 to 4
Texture—fine sandy loam, sandy loam, or loam

1290—Brandsvold fine sandy loam, thick solum

Composition

Brandsvold and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drainageways and flats on moraines
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 9.4 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Kandota and similar soils
- Knute and similar soils
- Soils that have a clayey subsoil
- Bluffton and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1350—Brandsvold loam, thick solum

Composition

Brandsvold and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on moraines
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Kandota and similar soils
- Knute and similar soils
- Soils that have a clayey subsoil
- Bluffton and similar soils
- Cathro and similar soils
- Mahkonce and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Buse Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate or moderately slow

Landform: Moraines
Parent material: Till
Slope range: 3 to 20 percent
Taxonomic classification: Fine-loamy, mixed Udic Calciborolls

Typical Pedon

Buse loam, in an area of Barnes-Buse complex, 2 to 6 percent slopes, 2,400 feet east and 155 feet south of the northwest corner of sec. 34, T. 132 N., R. 43 W.

Ap—0 to 8 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; common fine and medium roots; common fine irregular light gray (10YR 7/2) soft masses of carbonates; about 2 percent gravel; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bk1—8 to 22 inches; yellowish brown (10YR 5/4) loam; weak fine subangular blocky structure; friable; common medium irregular light gray (10YR 7/2) soft masses of carbonates; about 2 percent gravel; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—22 to 40 inches; light olive brown (2.5Y 5/4) loam; weak coarse subangular blocky structure; friable; few fine distinct light brownish gray (2.5Y 6/2) relict Fe depletions and prominent strong brown (7.5YR 5/6) relict Fe concentrations; common coarse irregular light gray (10YR 7/2) carbonate threads; about 2 percent gravel; strongly effervescent; slightly alkaline; clear smooth boundary.

C—40 to 60 inches; light olive brown (2.5Y 5/4) loam; massive; friable; common medium distinct grayish brown (2.5Y 5/2) relict Fe depletions and few medium and coarse distinct light olive brown (2.5Y 5/6) relict Fe concentrations; about 2 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: At the surface
Thickness of the mollic epipedon: 7 to 10 inches
Content of rock fragments: 2 to 12 percent throughout

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—2 to 6
Texture—loam or clay loam

Bygland Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderately slow; next part—moderately slow or slow; lower part—moderately slow
Landforms: Moraines, lake terraces, and ice-walled lake plains
Parent material: Lacustrine deposits
Slope range: 1 to 15 percent
Taxonomic classification: Fine, montmorillonitic Aquertic Argiborolls

Typical Pedon

Bygland silty clay loam, 1 to 6 percent slopes, 850 feet north and 2,450 feet east of the southwest corner of sec. 25, T. 133 N., R. 42 W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; friable; common fine roots; neutral; abrupt smooth boundary.

Bt1—10 to 17 inches; dark grayish brown (2.5Y 4/2) silty clay; moderate medium subangular blocky structure; firm; common fine roots; few distinct very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; neutral; clear wavy boundary.

Bt2—17 to 32 inches; dark grayish brown (2.5Y 4/2) silty clay; strong medium angular blocky structure; firm; few fine roots; few distinct very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; few fine distinct light olive brown (2.5Y 5/6) Fe concentrations; neutral; clear wavy boundary.

Bt3—32 to 41 inches; olive brown (2.5Y 4/3) silty clay loam; strong medium subangular blocky structure; firm; few discontinuous distinct very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; few fine prominent yellowish brown (10YR 5/8) Fe concentrations; neutral; clear wavy boundary.

BC—41 to 46 inches; light olive brown (2.5Y 5/4) silty clay loam; weak fine subangular blocky structure; firm; few discontinuous prominent very dark grayish brown (10YR 3/2) clay films in root channels and pores; common medium distinct

grayish brown (2.5Y 5/2) and common medium prominent yellowish brown (10YR 5/6) Fe concentrations; slightly effervescent; slightly alkaline; gradual wavy boundary.

C—46 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam; massive; firm; common medium distinct grayish brown (2.5Y 5/2) and few prominent yellowish brown (10YR 5/6) Fe concentrations; few fine light gray (10YR 7/2) carbonate threads; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 16 to 42 inches
Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: Typically none throughout

A horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—silty clay loam

Bt horizon:
Hue—10YR or 2.5Y
Value—2 to 4
Chroma—2 to 4
Texture—silty clay, clay, or silty clay loam

BC horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 5
Texture—silty clay loam or silt loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—2 to 4
Texture—dominantly silty clay loam or silt loam; varved with very thin lenses of loamy very fine sand or very fine sand in some pedons

422B—Bygland silty clay loam, 1 to 6 percent slopes

Composition

Bygland and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landforms: Moraines, lake terraces, and ice-walled lake plains
Position on the landform: Summits and backslopes
Slope range: 1 to 6 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Lacustrine deposits
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Lizzie and similar soils
- Dent and similar soils
- Lindaas and similar soils
- Soils that are underlain by loamy till
- Cathro and similar soils
- Parnell and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

422C—Bygland silty clay loam, 6 to 15 percent slopes

Composition

Bygland and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landforms: Moraines, lake terraces, and ice-walled lake plains
Position on the landform: Backslopes and shoulders
Slope range: 6 to 15 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth class: Very deep (more than 60 inches)

Drainage class: Moderately well drained
Dominant parent material: Lacustrine deposits
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lizzie and similar soils
- Dent and similar soils
- Lindaas and similar soils
- Soils that are underlain by loamy till
- Cathro and similar soils
- Parnell and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Cathro Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Upper part—moderately rapid to moderately slow; lower part—moderately slow or moderate
Landforms: Lake plains and moraines
Parent material: Organic material over glaciolacustrine deposits or till
Slope range: 0 to 1 percent
Taxonomic classification: Loamy, mixed Euic Terric Borosaprists

Typical Pedon

Cathro muck, 1,200 feet west and 1,500 feet north of the southeast corner of sec. 13, T. 137 N., R. 36 W.

Oa1—0 to 16 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 50 percent fiber, 10 percent rubbed; weak fine granular structure; very friable; many fine roots; primarily herbaceous fibers, about 10 percent woody fragments; neutral; clear irregular boundary.

Oa2—16 to 38 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 30 percent fibers, 10 percent rubbed; very friable; common fine roots; primarily herbaceous fibers, about 10 percent woody fragments; neutral; clear smooth boundary.

A1—38 to 44 inches; black (N 2/0) mucky sandy loam; massive; friable; neutral; clear smooth boundary.

A2—44 to 48 inches; black (N 2/0) loam; massive; friable; strongly effervescent; slightly alkaline; clear smooth boundary.

Cg—48 to 60 inches; dark grayish brown (2.5Y 4/2) gravelly sandy loam; massive; friable; many coarse faint olive gray (5Y 3/2) Fe depletions; about 20 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 16 to more than 60 inches
Thickness of the histic epipedon: 16 to 50 inches
Content of woody fragments in the organic material: 0 to 15 percent

Oa horizon:
Hue—10YR, 7.5YR, 5YR, or neutral
Value—2 or 3
Chroma—0 to 3
Texture—muck

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—sandy loam, fine sandy loam, sandy clay loam, or loam or the mucky analogs of these textures

C horizon:
Hue—2.5Y, 5Y, 2.5Y, 5GY, or 5BG
Value—4 to 6
Chroma—1 or 2
Texture—sandy loam, fine sandy loam, loam, or sandy clay loam
Content of rock fragments—0 to 25 percent gravel by volume

544—Cathro muck

Composition

Cathro and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landforms: Depressions on lake plains and moraines
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials over glaciolacustrine deposits or till
Flooding: None
Seasonal high water table: 1 foot above to 1 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 20.4 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Egglake and similar soils
- Bluffton and similar soils
- Runeberg and similar soils
- Friberg and similar soils
- Knute and similar soils

Major Uses of the Unit

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Figure 13.—Typical profile of Chapett loam. The subsoil has an accumulation of clay from a depth of 7 to 16 inches and an accumulation of lime below a depth of 16 inches. Depth is marked in feet.

Chapett Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Moraines
Parent material: Till
Slope range: 1 to 30 percent
Taxonomic classification: Fine-loamy, mixed Boralfic Udic Argiborolls

Typical Pedon

Chapett loam (fig. 13), in an area of Chapett-Sisseton complex, 6 to 12 percent slopes, eroded, 1,100 feet west and 1,300 feet north of the southeast corner of sec. 13, T. 133 N., R. 42 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; friable; common fine roots; about 2 percent gravel; neutral; abrupt smooth boundary.

Bt—7 to 16 inches; brown (10YR 4/3) sandy clay loam; weak medium prismatic structure parting to weak fine subangular blocky; friable; common fine roots; common faint very dark grayish brown (10YR 3/2) clay films on faces of peds; many distinct light

brownish gray (10YR 6/2) sand and silt coatings on faces of peds in the upper part; about 2 percent gravel; slightly acid; gradual wavy boundary.

Btk—16 to 19 inches; brown (10YR 5/3) sandy loam; weak medium prismatic structure parting to weak fine subangular blocky; friable; few fine roots; common distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; common light gray (10YR 7/2) carbonate coatings on ped interiors; about 3 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk—19 to 27 inches; light yellowish brown (10YR 6/4) sandy loam; weak medium platy structure; friable; few fine roots; common fine light gray (10YR 7/2) carbonate coatings on faces of peds and in pores; about 5 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—27 to 60 inches; yellowish brown (10YR 5/4) sandy loam; weak medium platy soil fragments; friable; few fine distinct yellowish brown (10YR 5/6) relict Fe concentrations; about 4 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 14 to 28 inches
Thickness of the mollic epipedon: 7 to 10 inches
Content of rock fragments: 2 to 10 percent throughout

Ap or A horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—loam

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 to 6
Texture—sandy clay loam, fine sandy loam, sandy loam, or loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 to 6
Texture—fine sandy loam, sandy loam, or loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 to 6
Texture—fine sandy loam, sandy loam, or loam

760C2—Chapett-Sisseton complex, 6 to 12 percent slopes, eroded

Composition

Chapett and similar soils: About 55 percent
Sisseton and similar soils: About 30 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Chapett

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.0 inches
Organic matter content: Moderate

Sisseton

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Quam and similar soils
- Friberg and similar soils
- Cathro and similar soils
- Roliss and similar soils
- Areas that have stones on the surface
- Areas that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

760D2—Chapett-Sisseton complex, 12 to 20 percent slopes, eroded

Composition

Chapett and similar soils: About 50 percent
Sisseton and similar soils: About 35 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Chapett

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.8 inches
Organic matter content: Moderate

Sisseton

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Quam and similar soils
- Friberg and similar soils
- Cathro and similar soils
- Weetown and similar soils
- Areas that have stones on the surface
- Areas that have slopes of more than 20 percent or less than 12 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1102B—Chapett-Dorset complex, 1 to 6 percent slopes

Composition

Chapett and similar soils: About 50 percent
Dorset and similar soils: About 35 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: 1 to 6 percent

Component Description

Chapett

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.4 inches
Organic matter content: Moderate

Dorset

Texture of the surface layer: Sandy loam

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.3 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Weetown and similar soils
- Friberg and similar soils
- Quam and similar soils
- Almora and similar soils
- Areas that have slopes of more than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1102C—Chapett-Dorset complex, 6 to 12 percent slopes, eroded

Composition

Chapett and similar soils: About 50 percent
Dorset and similar soils: About 35 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Chapett

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.2 inches
Organic matter content: Moderate

Dorset

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.5 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Weetown and similar soils
- Friberg and similar soils
- Quam and similar soils
- Almora and similar soils
- Areas that have slopes of more than 12 percent
- Sisseton and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1112D—Chapett-Corliss complex, 12 to 20 percent slopes, eroded

Composition

Chapett and similar soils: About 50 percent
Corliss and similar soils: About 35 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Chapett

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.1 inches
Organic matter content: Moderate

Corliss

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Sisseton and similar soils
- Weetown and similar soils
- Dorset and similar soils
- Friberg and similar soils
- Quam and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1112E—Chapett-Corliss complex, 20 to 30 percent slopes

Composition

Chapett and similar soils: About 50 percent
Corliss and similar soils: About 35 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 20 to 30 percent

Component Description

Chapett

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.2 inches
Organic matter content: Moderate

Corliss

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.0 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Sisseton and similar soils
- Weetown and similar soils
- Dorset and similar soils
- Friberg and similar soils
- Quam and similar soils
- Areas that have stones on the surface

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1232B—Chapett loam, 2 to 6 percent slopes

Composition

Chapett and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Sisseton and similar soils
- Weetown and similar soils
- Friberg and similar soils
- Cathro and similar soils
- Areas that have slopes of more than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1232E—Chapett loam, 20 to 30 percent slopes

Composition

Chapett and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 20 to 30 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Sisseton and similar soils
- Weetown and similar soils
- Friberg and similar soils
- Cathro and similar soils
- Areas that have slopes of more than 30 percent or less than 20 percent

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Clearriver Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 3 percent
Taxonomic classification: Mixed, frigid Aquic Udipsamments

Typical Pedon

Clearriver loamy coarse sand, in an area of Bluffcreek-Clearriver complex, 2,200 feet north and 2,300 feet

east of the southwest corner of sec. 23, T. 132 N., R. 37 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy coarse sand, grayish brown (10YR 5/2) dry; weak fine and medium subangular blocky structure; friable; about 3 percent gravel; many very fine and fine roots; slightly acid; abrupt smooth boundary.

E—9 to 13 inches; brown (10YR 5/3) loamy coarse sand, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; friable; about 3 percent gravel; many very fine and fine roots; slightly acid; clear wavy boundary.

E&Bt1—13 to 21 inches; brown (10YR 5/3) loamy sand (E); single grain; loose; lamellae and bands of brown (7.5YR 4/4) sandy loam (Bt); moderate fine and medium subangular blocky structure; friable; bands are 1/8 to 1/2 inch thick with a cumulative thickness of less than 3 inches; many discontinuous prominent dark brown (7.5YR 3/4) clay films on faces of peds; common very fine and fine roots; about 12 percent gravel; slightly acid; clear wavy boundary.

E&Bt2—21 to 48 inches; dark yellowish brown (10YR 4/4) sand (E); single grain; loose; lamellae of brown (7.5YR 4/4) loamy sand (Bt); single grain; loose; lamellae are 1/8 to 3/8 inch thick and are characterized by dark brown (7.5YR 3/4) clay bridging between sand grains; many fine and medium prominent light brownish gray (2.5Y 6/2) Fe depletions and many fine distinct yellowish brown (10YR 5/8) Fe concentrations; about 12 percent gravel; slightly acid; clear wavy boundary.

Cg—48 to 60 inches; brownish gray (2.5Y 5/2) gravelly sand; single grain; loose; many fine and medium distinct light olive brown (2.5Y 5/6) Fe concentrations; about 20 percent gravel; slight effervescence; slightly alkaline.

Range in Characteristics

Depth to carbonates: 13 to 60 inches
Content of rock fragments: 5 to 35 percent throughout

Ap or A horizon:
Hue—10YR
Value—2 to 4
Chroma—1 or 2
Texture—loamy coarse sand

E horizon:
Hue—10YR or 7.5YR
Value—3 to 6
Chroma—2 to 6
Texture—sand, loamy sand, loamy coarse sand, loamy fine sand, or fine sand or the gravelly analogs of these textures

E part of the E&Bt horizon:
Hue—10YR or 7.5YR
Value—3 to 6
Chroma—2 to 6
Texture—loamy sand, loamy fine sand, fine sand, or sand

Bt part of the E&Bt horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—4 to 6
Texture—coarse sandy loam, sandy clay loam, sandy loam, loamy sand, or loamy coarse sand or the gravelly analogs of these textures

Cg horizon:
Hue—10YR or 2.5Y
Value—4 to 7
Chroma—2 to 4
Texture—coarse sand, sand, or fine sand or the gravelly analogs of these textures

Clitherall Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderately rapid; next part—rapid; lower part—moderate
Landform: Moraines
Parent material: Glacial outwash over till
Slope range: 0 to 3 percent
Taxonomic classification: Coarse-loamy, mixed Aquic Argiborolls

Typical Pedon

Clitherall coarse sandy loam, in an area of Clitherall-Wykeham complex, 325 feet south and 2,700 feet east of the northwest corner of sec. 6, T. 136 N., R. 37 W.

Ap—0 to 11 inches; very dark brown (10YR 2/2) coarse sandy loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; friable; common very fine and fine roots; about 5 percent gravel; moderately acid; abrupt smooth boundary.

Bt1—11 to 16 inches; dark yellowish brown (10YR 4/4) coarse sandy loam; moderate medium subangular blocky structure; friable; common continuous faint brown (10YR 4/3) clay films on faces of peds and few discontinuous distinct dark brown (10YR 3/3) clay films on faces of peds and in pores; common discontinuous very pale brown (10YR 7/3) fine

sand and silt coatings on faces on peds; few very fine and fine roots; about 10 percent gravel; slightly acid; clear smooth boundary.

Bt2—16 to 23 inches; dark yellowish brown (10YR 4/4) gravelly loamy coarse sand; weak medium and coarse subangular blocky structure; very friable; many very thick continuous distinct very dark grayish brown (10YR 3/2) and many continuous faint dark brown (10YR 3/3) clay films between and on sand grains and pebbles; few very fine and fine roots; about 17 percent gravel; slightly acid; clear smooth boundary.

Bt3—23 to 30 inches; dark brown (10YR 3/3) gravelly coarse sandy loam; weak medium and coarse subangular blocky structure; friable; many continuous faint very dark grayish brown (10YR 3/2) clay films on faces of peds; about 16 percent gravel; neutral; clear smooth boundary.

Bw—30 to 45 inches; dark yellowish brown (10YR 4/4) gravelly sand; single grain; loose; common coarse distinct light brownish gray (10YR 6/2) Fe depletions and common medium distinct yellowish brown (10YR 5/6) Fe concentrations; about 18 percent gravel; slightly effervescent; slightly alkaline; abrupt smooth boundary.

2Btk—45 to 52 inches; olive (5Y 5/3) loam; strong fine and medium subangular blocky structure; firm; common fine and medium distinct dark gray (5Y 4/1) Fe depletions and common fine prominent light olive brown (2.5Y 5/6) Fe concentrations; few patchy prominent very dark grayish brown (2.5Y 3/2) clay films in root channels and pores; common calcium carbonate coatings on faces of peds; about 5 percent gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

2Bk—52 to 64 inches; light olive brown (2.5Y 5/4) sandy loam; strong medium and thick platy structure parting to weak fine subangular blocky; friable; patchy prominent yellowish brown (10YR 5/6) Fe stains on faces of peds; few fine prominent dark gray (5Y 4/1) Fe depletions; common calcium carbonate coatings on faces of peds; about 5 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C—64 to 80 inches; light olive brown (2.5Y 5/4) sandy loam; massive parting to strong medium and thick plate-like soil aggregates; friable; patchy prominent yellowish brown (10YR 5/8) Fe stains on faces of peds; few fine distinct grayish brown (2.5Y 5/2) Fe depletions; few calcium carbonate coatings on faces of peds; about 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 24 to 40 inches
Thickness of the mollic epipedon: 8 to 16 inches
Thickness of the loamy mantle: 15 to 24 inches
Depth to glacial till: 40 to 60 inches
Other features: Some pedons have a Bk horizon.

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—coarse sandy loam
Content of rock fragments—1 to 10 percent gravel

Bt horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—3 to 6
Texture—dominantly sandy loam, fine sandy loam, or coarse sandy loam or the gravelly analogs of these textures; subhorizons of sandy clay loam, loamy sand, loamy coarse sand, loam, coarse sand, or sand in some pedons
Content of rock fragments—5 to 35 percent gravel

Bw horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loamy sand, loamy coarse sand, sand, or coarse sand or the gravelly analogs of these textures
Content of rock fragments—10 to 35 percent gravel

2Bk or 2Btk horizon
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—2 to 4
Texture—sandy loam, fine sandy loam, or loam
Content of rock fragments—1 to 10 percent gravel

2C horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—2 to 4
Texture—sandy loam, fine sandy loam, or loam
Content of rock fragments—1 to 10 percent gravel by volume

1103—Clitherall sandy loam

Composition

Clitherall and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on moraines
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash over till
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.4 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Dorset and similar soils
- Oylen and similar soils
- Wykeham and similar soils
- Pinelake and similar soils
- Brandsvold and similar soils
- Kratka and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1341—Clitherall-Wykeham complex

Composition

Clitherall and similar soils: About 60 percent
Wykeham and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Clitherall—flats and swales; Wykeham—footslopes and toeslopes
Slope range: 1 to 3 percent

Component Description

Clitherall

Texture of the surface layer: Coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash over till
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.3 inches
Organic matter content: High

Wykeham

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.5 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Kandota and similar soils
- Pinelake and similar soils
- Brandsvold and similar soils
- Kratka and similar soils
- Soils that formed in outwash
- Areas that have stones on the surface

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Clontarf Series

Depth class: Very deep
Drainage class: Moderately well drained

Permeability: Upper part—moderately rapid; lower part—rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 3 percent
Taxonomic classification: Coarse-loamy, mixed Pachic Udic Haploborolls

Typical Pedon

Clontarf sandy loam, 500 feet north and 1,200 feet west of the southeast corner of sec. 30, T. 136 N., R. 43 W.

Ap—0 to 9 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak very fine subangular blocky structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.
A—9 to 13 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak very fine subangular blocky structure; very friable; common fine roots; neutral; clear smooth boundary.
Bw1—13 to 18 inches; very dark grayish brown (10YR 3/2) sandy loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; common fine roots; neutral; clear smooth boundary.
Bw2—18 to 24 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 4/3) dry; weak fine subangular blocky structure; very friable; common fine roots; neutral; clear smooth boundary.
2C1—24 to 36 inches; light olive brown (2.5Y 5/4) loamy sand; massive; very friable; few fine roots; common medium distinct grayish brown (2.5Y 5/2) Fe depletions and common fine distinct light olive brown (2.5Y 5/6) Fe concentrations; neutral; clear smooth boundary.
2C2—36 to 60 inches; light yellowish brown (2.5Y 6/4) sand; single grain; loose; common fine distinct light brownish gray (2.5Y 6/2) Fe depletions and common fine distinct light olive brown (2.5Y 5/6) Fe concentrations; neutral.

Range in Characteristics

Depth to carbonates: 40 to more than 60 inches
Thickness of the mollic epipedon: 16 to 34 inches
Thickness of the loamy mantle: 20 to 36 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—sandy loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—2 or 3
Texture—sandy loam, fine sandy loam, or loam

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—sand, fine sand, loamy sand, or loamy fine sand
Content of rock fragments—0 to 15 percent

371—Clontarf sandy loam

Composition

Clontarf and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on pitted outwash plains
Position on the landform: Footslopes and toeslopes
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 6.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Arvilla and similar soils
- Sverdrup and similar soils
- Sandberg and similar soils
- Forada and similar soils
- Egeland and similar soils
- Very poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Clotho Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderate; next part—moderately slow; lower part—moderate
Landform: Moraines
Parent material: Till
Slope range: 0 to 2 percent
Taxonomic classification: Coarse-loamy, mixed (calcareous), frigid Typic Endoaquolls

Typical Pedon

Clotho loam, moderately permeable, 1,950 feet east and 2,630 feet south of the northwest corner of sec. 34, T. 134 N., R. 37 W.

A—0 to 9 inches; black (2.5Y 2/0) loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; friable; about 1 percent gravel; common very fine and fine roots; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Ag—9 to 14 inches; very dark grayish brown (10YR 2/1) sandy loam, dark gray (10YR 4/2) dry; moderate medium subangular blocky structure; friable; common fine prominent dark reddish brown (5YR 3/4) Fe concentrations; about 1 percent gravel; common fine roots; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bw—14 to 18 inches; dark grayish brown (2.5Y 5/3) sandy loam; weak coarse subangular blocky structure; very friable; common medium and coarse prominent yellowish brown (10YR 5/6) Fe concentrations; about 1 percent gravel; few very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

C1—18 to 28 inches; light brownish gray (2.5Y 6/2) fine sandy loam; massive; friable; common fine and medium prominent brownish yellow (10YR 6/8) Fe concentrations; about 1 percent gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—28 to 60 inches; light brownish gray (2.5Y 6/2) sandy loam; many coarse faint light olive brown (2.5Y 5/3) mottles; massive parting to weak thin and medium platy soil fragments; very friable; common medium prominent reddish yellow (7.5YR 6/8) and many coarse prominent (10YR 6/6) Fe concentrations; about 5 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: At the surface
Thickness of the mollic epipedon: 10 to 20 inches
Content of rock fragments: 2 to 20 percent throughout

Ap or A horizon:
Hue—10YR, 2.5Y, or 5Y
Value—1 to 3
Chroma—1 or 2
Texture—sandy loam or loam

Bg or Bw horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 6
Chroma—1 to 6
Texture—sandy loam or fine sandy loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6
Chroma—1 to 4
Texture—sandy loam or fine sandy loam

1349—Clotho loam, moderately permeable

Composition

Clotho and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Flats and swales on moraines
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 9.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Kandota and similar soils
- Knute and similar soils
- Brandsvold and similar soils

- Bluffton and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Corliss Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid or very rapid
Landforms: Pitted outwash plains and moraines
Parent material: Glacial outwash
Slope range: 1 to 35 percent
Taxonomic classification: Mixed, frigid Typic Udipsamments

Typical Pedon

Corliss loamy sand, 6 to 12 percent slopes, 1,650 feet north and 1,625 feet west of the southeast corner of sec. 4, T. 136 N., R. 39 W.

Ap—0 to 7 inches; black (10YR 2/1) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; very friable; common very fine and fine roots; about 2 percent gravel; neutral; abrupt smooth boundary.

Bw—7 to 28 inches; dark yellowish brown (10YR 4/4) coarse sand; single grain; loose; few very fine and fine roots; about 13 percent gravel; neutral; clear smooth boundary.

C—28 to 60 inches; yellowish brown (10YR 5/4) gravelly coarse sand; single grain; loose; about 32 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 40 inches
Content of rock fragments: 10 to 35 percent

Ap or A horizon:
Hue—10YR
Value—2 to 4
Chroma—1 to 3
Texture—loamy sand or loamy coarse sand

Bw horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—3 or 4
Texture—loamy sand, loamy coarse sand, coarse sand, or sand or the gravelly analogs of these textures

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—coarse sand, sand, or the gravelly analogs of these textures

721B—Corliss loamy sand, 2 to 6 percent slopes

Composition

Corliss and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Radium and similar soils
- Isan and similar soils
- Abbeylake and similar soils
- Clontarf and similar soils
- Areas that have slopes of more than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

721C—Corliss loamy sand, 6 to 12 percent slopes

Composition

Corliss and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Dorset and similar soils
- Radium and similar soils
- Isan and similar soils
- Clontarf and similar soils
- Very poorly drained soils
- Areas that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

721D—Corliss loamy sand, 12 to 20 percent slopes

Composition

Corliss and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Dorset and similar soils
- Radium and similar soils
- Isan and similar soils
- Clontarf and similar soils
- Nidaros and similar soils
- Areas that have slopes of more than 20 percent or less than 12 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

721E—Corliss loamy sand, 20 to 35 percent slopes

Composition

Corliss and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 20 to 35 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.0 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Lida and similar soils
- Rushlake and similar soils
- Hangaard and similar soils
- Nidaros and similar soils
- Clontarf and similar soils
- Areas that have slopes of more than 35 percent or less than 20 percent

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1247D—Corliss-Dorset complex, 12 to 20 percent slopes

Composition

Corliss and similar soils: About 65 percent
Dorset and similar soils: About 25 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Corliss

Texture of the surface layer: Loamy coarse sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.0 inches
Organic matter content: Moderate

Dorset

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Oakcreek and similar soils
- Oylen and similar soils
- Almora and similar soils
- Leafriver and similar soils
- Nidaros and similar soils
- Pinelake and similar soils

Major Uses of the Unit

- Cropland

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1277D—Corliss-Sverdrup complex, 12 to 20 percent slopes

Composition

Corliss and similar soils: About 55 percent
Sverdrup and similar soils: About 30 percent
Inclusions: About 15 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 12 to 18 percent

Component Description

Corliss

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.3 inches
Organic matter content: Moderate

Sverdrup

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Clontarf and similar soils
- Forada and similar soils
- Areas that have slopes of more than 20 percent or less than 12 percent
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Darnen Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Moraines
Parent material: Colluvium over till
Slope range: 0 to 3 percent
Taxonomic classification: Fine-loamy, mixed Pachic Udic Haploborolls

Typical Pedon

Darnen loam, moderately wet, 2,500 feet north and 900 feet east of the southwest corner of sec. 9, T. 136 N., R. 44 W.

Ap—0 to 9 inches; black (10YR 2/1) loam, very dark grayish brown (10YR 3/2) dry; weak medium subangular blocky structure; very friable; common fine roots; neutral; abrupt smooth boundary.

A—9 to 26 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; very friable; common fine roots; neutral; clear smooth boundary.

AB—26 to 36 inches; very dark brown (10YR 2/2) loam, very dark gray (10YR 3/1) dry; moderate medium angular blocky structure; friable; common fine roots; few very dark gray (10YR 3/1) sand coatings on faces of peds; neutral; clear smooth boundary.

Bw—36 to 43 inches; light olive brown (2.5Y 5/4) loam; moderate medium subangular blocky structure; friable; few fine roots; common fine prominent brownish yellow (10YR 6/8) Fe concentrations; neutral; clear smooth boundary.

C1—43 to 56 inches; light brownish gray (2.5Y 6/2) loam; friable; common fine prominent brownish yellow (10YR 6/6) and medium brownish yellow

(10YR 6/8) Fe concentrations; about 1 percent gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—56 to 60 inches; light brownish gray (2.5Y 6/2) loam; friable; common coarse prominent yellowish brown (10YR 5/8) and brownish yellow (10YR 6/8) Fe concentrations; about 2 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to 60 inches
Thickness of the mollic epipedon: 24 to 48 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—loam or clay loam
Content of rock fragments—1 to 5 percent

494—Darnen loam, moderately wet

Composition

Darnen and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Swales on moraines
Position on the landform: Toeslopes
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium over till
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Barnes and similar soils
- Langhei and similar soils
- Lakepark and similar soils
- Soils that have carbonates above the subsoil
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Dent Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landforms: Lake terraces, pitted outwash plains, and kame moraines
Parent material: Glaciolacustrine deposits
Slope range: 1 to 6 percent
Taxonomic classification: Fine-silty, mixed Aquic Argiborolls

Typical Pedon

Dent silt loam, 1 to 6 percent slopes, 1,850 feet south and 250 feet east of the northwest corner of sec. 22, T. 135 N., R. 41 W.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

A—9 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; friable; common discontinuous very fine sand and silt coatings on faces of peds; neutral; abrupt smooth boundary.

Bt1—12 to 18 inches; brown (10YR 4/3) silty clay loam; strong coarse prismatic structure parting to strong medium angular blocky; firm; many continuous distinct very dark brown (10YR 2/2) clay films on faces of peds and in pores; neutral; clear smooth boundary.

Bt2—18 to 26 inches; brown (10YR 4/3) silt loam; moderate coarse prismatic structure parting to moderate medium angular blocky; firm; common fine distinct grayish brown (2.5Y 5/2) Fe depletions; common continuous distinct very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; neutral; clear smooth boundary.

Btk1—26 to 44 inches; light yellowish brown (10YR 6/4) silt loam; weak coarse subangular blocky structure; friable; common medium prominent strong brown (7.5YR 4/6) Fe concentrations and common fine prominent grayish brown (2.5Y 5/2) Fe depletions; common discontinuous prominent dark brown (7.5YR 3/2) clay films in pores; common light gray (10YR 7/2) carbonate coatings on faces of peds; strongly effervescent; moderately alkaline; clear smooth boundary.

Btk2—44 to 54 inches; light yellowish brown (10YR 6/4) silt loam; weak thick platy structure parting to moderate medium subangular blocky; friable; common medium prominent brownish yellow (10YR 6/8) Fe concentrations and few fine prominent grayish brown (2.5Y 5/2) Fe depletions; common discontinuous prominent dark brown (7.5YR 3/2) clay films in pores; common light gray (10YR 7/2) carbonate coatings on faces of peds; strongly effervescent; moderately alkaline; clear smooth boundary.

C—54 to 80 inches; light olive brown (2.5Y 5/3) silt loam; massive parting to moderate thick platy soil fragments; friable; common coarse prominent strong brown (7.5YR 4/6) Fe concentrations and few fine faint grayish brown (2.5Y 5/2) Fe depletions; few light gray (10YR 7/2) carbonate coatings on vertical fractures; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 15 to 40 inches
Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: 0 to 2 percent throughout

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bt horizon:
Hue—10YR, 7.5YR, or 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—silty clay loam, silt loam, or loam

Btk horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—silt loam, loam, very fine sandy loam, or thin layers of loamy very fine sand or very fine sand

C horizon:
Hue—2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—silt loam, loam, very fine sandy loam, or thin layers of loamy very fine sand or very fine sand

1105B—Dent silt loam, 1 to 6 percent slopes

Composition

Dent and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landforms: Moraines and lake terraces
Position on the landform: Backslopes and toeslopes
Slope range: 1 to 6 percent

Component Description

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Lizzie and similar soils
- Almora and similar soils
- Lida and similar soils
- Bluffcreek and similar soils
- Lindaas and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Dickey Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—rapid; lower part—moderately slow or moderate
Landform: Moraines
Parent material: Glacial outwash over till
Slope range: 1 to 5 percent
Taxonomic classification: Sandy over loamy, mixed Udorthentic Haploborolls

Typical Pedon

Dickey loamy fine sand, 1 to 5 percent slopes, 250 feet east and 2,000 feet south of the northwest corner of sec. 10, T. 132 N., R. 44 W.

Ap—0 to 9 inches; black (10YR 2/1) loamy fine sand, very dark gray (10YR 3/1) dry; weak fine granular structure; very friable; neutral; abrupt smooth boundary.

A—9 to 13 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; very friable; few fine and very fine roots; neutral; clear smooth boundary.

Bw1—13 to 18 inches; brown (10YR 4/3) loamy fine sand; weak fine subangular blocky structure; very friable; few fine and very fine roots; neutral; gradual wavy boundary.

Bw2—18 to 28 inches; dark yellowish brown (10YR 4/4) fine sand; single grain; loose; few very fine roots; neutral; clear wavy boundary.

2Bk—28 to 49 inches; pale brown (10YR 6/3) clay loam; weak medium subangular blocky structure; firm; few fine and very fine roots; many faint very pale brown (10YR 7/3) carbonate coatings on faces of peds; about 1 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

2C—49 to 60 inches; light olive brown (2.5Y 5/4) clay loam; massive; firm; about 2 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 20 to 40 inches
Thickness of the mollic epipedon: 10 to 16 inches
Depth to glacial till: 20 to 40 inches

Ap or A horizon:
Hue—10YR
Value—2 to 4
Chroma—1
Texture—loamy fine sand

Bw horizon:
Hue—10YR or 2.5Y
Value—2 to 5
Chroma—1 to 4
Texture—loamy fine sand, fine sand, loamy sand

2Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loam, clay loam, silt loam, or silty clay loam
Content of rock fragments—1 to 10 percent

2C horizon:
Hue—10YR to 5Y
Value—4 to 6
Chroma—2 to 4
Texture—loam or clay loam
Content of rock fragments—1 to 10 percent

609B—Dickey loamy fine sand, 1 to 5 percent slopes

Composition

Dickey and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: 1 to 5 percent

Component Description

Texture of the surface layer: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash over till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 7.9 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Formdale and similar soils
- Swenoda and similar soils
- Areas that have slopes of more than 5 percent
- Soils in which the till is at a greater depth than in the Dickey soil

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Doran Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Upper part—moderately slow; next part—slow or moderately slow; lower part—moderately slow or moderate
Landform: Lake plains
Parent material: Glaciolacustrine deposits over till
Slope range: 0 to 2 percent
Taxonomic classification: Fine, montmorillonitic Aquertic Argiborolls

Typical Pedon

Doran clay loam, 380 feet east and 200 feet south of the northwest corner of sec. 19, T. 131 N., R. 44 W.

Ap—0 to 9 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; friable; many fine roots; neutral; clear smooth boundary.

Bt—9 to 19 inches; olive brown (2.5Y 4/3) clay; weak medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; firm; common fine and very fine roots; common continuous faint dark grayish brown (2.5Y 4/2) clay films on faces of peds; neutral; clear wavy boundary.

2Bky—19 to 32 inches; grayish brown (2.5Y 5/2) clay loam; weak fine and medium subangular blocky structure; friable; few fine and very fine roots; few fine prominent yellowish brown (10YR 5/6) Fe concentrations; common discontinuous prominent light gray (10YR 7/2) carbonate coatings on faces of peds; many medium irregular soft masses of carbonate; few fine rounded masses of gypsum; about 2 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

2C—32 to 60 inches; grayish brown (2.5Y 5/2) clay loam; weak coarse prismatic soil fragments; firm; many medium and coarse yellowish brown (10YR 5/6) Fe concentrations; few medium irregular soft masses of iron-manganese; few fine irregular soft masses of carbonate; about 2 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 12 to 24 inches
Thickness of the mollic epipedon: 7 to 16 inches
Depth to the underlying glacial till: 15 to 40 inches
Content of rock fragments: 3 to 10 percent in the underlying glacial till

Ap or A horizon:
Hue—10YR
Value—2
Chroma—1
Texture—clay loam

Bt horizon:
Hue—2.5Y or 10YR
Value—2 to 4
Chroma—1 to 3
Texture—clay loam, clay, silty clay, or silty clay loam

2Bky horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 3
Texture—clay loam

2C horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 4
Texture—clay loam or loam

698—Doran clay loam

Composition

Doran and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Flats and swales on lake plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Depth to the water table: 3 to 5 feet
Available water capacity to 60 inches or root-limiting layer: About 9.7 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hamerly and similar soils
- Mustinka and similar soils
- Peever and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Dorset Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately rapid; lower part—rapid
Landforms: Pitted outwash plains and moraines
Parent material: Glacial outwash
Slope range: 0 to 20 percent
Taxonomic classification: Coarse-loamy, mixed Udic Argiborolls

Typical Pedon

Dorset sandy loam, 2 to 6 percent slopes, 1,690 feet east and 250 feet north of the southwest corner of sec. 13, T. 134 N., R. 41 W.

Ap—0 to 9 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; common very fine and fine roots; about 2 percent gravel; moderately acid; abrupt smooth boundary.

A—9 to 11 inches; very dark brown (10YR 2/2) sandy loam, very dark grayish brown (10YR 3/2) dry; moderate medium subangular blocky structure; friable; few very fine and fine roots; about 5 percent gravel; neutral; clear wavy boundary.

Bt1—11 to 15 inches; brown (10YR 4/3) sandy loam; moderate medium subangular blocky structure; friable; many discontinuous faint dark brown (10YR 3/3) clay films on faces of peds and in pores; about 5 percent gravel; neutral; clear wavy boundary.

Bt2—15 to 20 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; friable; common patchy faint dark yellowish brown (10YR 3/4) clay films on faces of peds; about 10 percent gravel; neutral; clear wavy boundary.

2Bk—20 to 38 inches; olive brown (2.5Y 4/4) gravelly coarse sand; single grain; loose; many light gray (10YR 7/2) carbonate coatings on the underside of pebbles; about 27 percent gravel; strongly effervescent; moderately alkaline; diffuse wavy boundary.

2C—38 to 60 inches; light olive brown (2.5Y 5/3) gravelly coarse sand; single grain; loose; few light gray (10YR 7/2) carbonate coatings on the underside of pebbles; about 30 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 15 to 36 inches
Thickness of the mollic epipedon: 7 to 15 inches
Thickness of the loamy mantle: 12 to 22 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam
Content of rock fragments—0 to 10 percent gravel

Bt horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—3 or 4
Texture—loam or sandy loam
Content of rock fragments—0 to 10 percent gravel

2Bt horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—3 or 4

Texture—dominantly gravelly loamy sand or gravelly loamy coarse sand; subhorizons of gravelly sandy loam, gravelly coarse sandy loam, gravelly sand, or gravelly coarse sand in some pedons
Content of rock fragments—15 to 35 percent gravel

2Bk horizon:
Hue—10YR or 7.5YR
Value—3 to 6
Chroma—3 to 6
Texture—dominantly gravelly coarse sand, gravelly loamy sand, or gravelly sand; subhorizons of coarse sand, sand, or loamy sand or the very gravelly analogs of these textures in some pedons
Content of rock fragments—dominantly 15 to 35 percent gravel; subhorizons with more than 35 percent gravel in some pedons

2C horizon:
Hue—10YR or 7.5YR
Value—3 to 6
Chroma—3 to 6
Texture—dominantly gravelly coarse sand, gravelly loamy sand, or gravelly sand; subhorizons of coarse sand, sand, or loamy sand or the very gravelly analogs of these textures in some pedons
Content of rock fragments—dominantly 15 to 35 percent gravel; subhorizons with more than 35 percent gravel in some pedons

406A—Dorset sandy loam, 0 to 2 percent slopes

Composition

Dorset and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flats on pitted outwash plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Corliss and similar soils
- Almora and similar soils
- Oylen and similar soils
- Pinelake and similar soils
- Areas that have slopes of more than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

406B—Dorset sandy loam, 2 to 6 percent slopes

Composition

Dorset and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Corliss and similar soils
- Almora and similar soils
- Oylen and similar soils
- Pinelake and similar soils
- Areas that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

778B—Dorset-Corliss complex, 1 to 6 percent slopes

Composition

Dorset and similar soils: About 70 percent
Corliss and similar soils: About 25 percent
Inclusions: About 5 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Summits and backslopes
Slope range: 1 to 6 percent

Component Description

Dorset

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.1 inches
Organic matter content: High

Corliss

Texture of the surface layer: Loamy coarse sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Oylen and similar soils
- Almora and similar soils
- Leafriver and similar soils
- Nidaros and similar soils
- Pinelake and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

778C—Dorset-Corliss complex, 6 to 12 percent slopes

Composition

Dorset and similar soils: About 50 percent
Corliss and similar soils: About 35 percent
Inclusions: About 15 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Dorset

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.0 inches
Organic matter content: High

Corliss

Texture of the surface layer: Loamy coarse sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.0 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Nitche and similar soils
- Oylen and similar soils
- Almora and similar soils
- Leafriver and similar soils
- Nidaros and similar soils
- Pinelake and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Duelm Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 2 percent
Taxonomic classification: Sandy, mixed Aquic Haploborolls

Typical Pedon

Duelm loamy sand, 430 feet north and 1,750 feet west of the southeast corner of sec. 1, T. 133 N., R. 39 W.

Ap—0 to 9 inches; black (10YR 2/1) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; soft; many very fine roots; neutral; abrupt smooth boundary.

AB—9 to 16 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; soft; common very fine roots; neutral; clear wavy boundary.

Bw1—16 to 29 inches; brown (10YR 4/3) sand; single grain; loose; few very fine roots; neutral; clear wavy boundary.

Bw2—29 to 35 inches; brown (10YR 5/3) sand; single grain; loose; few very fine roots; few fine faint grayish brown (10YR 5/2), common medium distinct yellowish brown (10YR 5/6), and few distinct dark yellowish brown (10YR 4/6) Fe concentrations; neutral; clear wavy boundary.

C—35 to 56 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; common medium distinct grayish brown (10YR 5/2) and common coarse prominent reddish brown (5YR 4/4) Fe concentrations; neutral; clear wavy boundary.

Cg—56 to 60 inches; light brownish gray (10YR 6/2) sand; single grain; loose; common fine prominent strong brown (7.5YR 5/6) Fe concentrations; neutral.

Range in Characteristics

Depth to carbonates: 40 to more than 60 inches
Thickness of the mollic epipedon: 10 to 20 inches
Content of rock fragments: 0 to 15 percent gravel

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy sand

Bw horizon:
Hue—10YR
Value—3 to 5
Chroma—2 to 4
Texture—coarse sand, sand, loamy sand, or loamy coarse sand

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 to 4
Texture—coarse sand or sand

260—Duelm loamy sand

Composition

Duelm and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on pitted outwash plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 5.2 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hubbard and similar soils
- Isan and similar soils
- Oylen and similar soils
- Leafriver and similar soils
- Verndale and similar soils
- Meehan and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Eagleview Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Landforms: Kame moraines and pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 30 percent
Taxonomic classification: Mixed, frigid Argic Udipsamments

Typical Pedon

Eagleview loamy sand (fig. 14), in an area of Sybil-

Figure 14.—Typical profile of Eagleview loamy sand. Dark brown, discontinuous lamellae range from 1/8 inch to 2 inches in thickness. Depth is marked in inches.

Eagleview complex, 2 to 8 percent slopes, 1,870 feet south and 1,060 feet west of the northeast corner of sec. 2, T. 137 N., R. 39 W.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak fine and medium subangular blocky structure; very friable; many fine and medium roots; slightly acid; abrupt smooth boundary.

E1—4 to 10 inches; dark yellowish brown (10YR 4/4) sand, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; very friable; common very fine and fine roots; neutral; clear wavy boundary.

E2—10 to 16 inches; yellowish brown (10YR 5/4)

sand, very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; very friable; common very fine and fine roots; neutral; gradual wavy boundary.

E3—16 to 36 inches; pale brown (10YR 6/3) sand, very pale brown (10YR 7/3) dry; single grain; loose; few very fine and fine roots; neutral; abrupt wavy boundary.

E&Bt—36 to 60 inches; light yellowish brown (10YR 6/4) sand (E); single grain; loose; bands of brown and dark brown (10YR 5/4 and 4/4) loamy sand (Bt); weak medium subangular blocky structure; friable; few very fine and fine roots; neutral.

Range in Characteristics

Content of rock fragments: 0 to 10 percent
Depth to carbonates: 25 to 60 inches

Ap or A horizon:
Hue—10YR
Value—3
Chroma—2 or 3
Texture—loamy sand

E horizon:
Hue—10YR
Value—4 to 6
Chroma—3
Texture—sand, coarse sand, loamy sand, or loamy coarse sand

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—4 to 6
Texture—sand or coarse sand

E part of the E&Bt horizon:
Hue—10YR
Value—5 or 6
Chroma—3 or 4
Texture—sand or coarse sand

Bt part of the E&Bt horizon:
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—3 or 4
Texture—loamy sand, loamy coarse sand, sandy loam, or coarse sandy loam

C horizon:
Hue—10YR
Value—5 or 6
Chroma—3 or 4
Texture of the fine-earth fraction—sand or coarse sand

Egeland Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Landforms: Outwash plains and moraines
Parent material: Glacial outwash
Slope range: 1 to 20 percent
Taxonomic classification: Coarse-loamy, mixed Udic Haploborolls

Typical Pedon

Egeland fine sandy loam, 1 to 6 percent slopes (fig. 15), 2,100 feet east and 1,300 feet south of the northwest corner of sec. 3, T. 133 N., R. 43 W.

Ap—0 to 9 inches; black (10YR 2/1) fine sandy loam, very dark gray (10YR 3/1) dry; weak fine and medium subangular blocky structure; friable; many fine and very fine roots; neutral; abrupt smooth boundary.

A—9 to 15 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine and medium subangular blocky structure; friable; many fine and very fine roots; neutral; clear smooth boundary.

Bw1—15 to 19 inches; brown (10YR 4/3) fine sandy loam; moderate fine and medium subangular blocky structure; friable; common fine and very fine roots; neutral; clear smooth boundary.

Bw2—19 to 31 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine and medium subangular blocky structure; friable; few fine and very fine roots; neutral; clear smooth boundary.

Bk—31 to 42 inches; light olive brown (2.5Y 5/3) fine sandy loam; weak medium subangular blocky structure; friable; carbonates disseminated throughout; few very fine roots; violently effervescent; moderately alkaline; clear wavy boundary.

C—42 to 60 inches; light olive brown (2.5Y 5/4) loamy fine sand; weak very fine subangular blocky soil aggregates; single grain; very friable; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 14 to 45 inches
Thickness of the mollic epipedon: 8 to 16 inches
Content of rock fragments: 0 to 10 percent throughout

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1

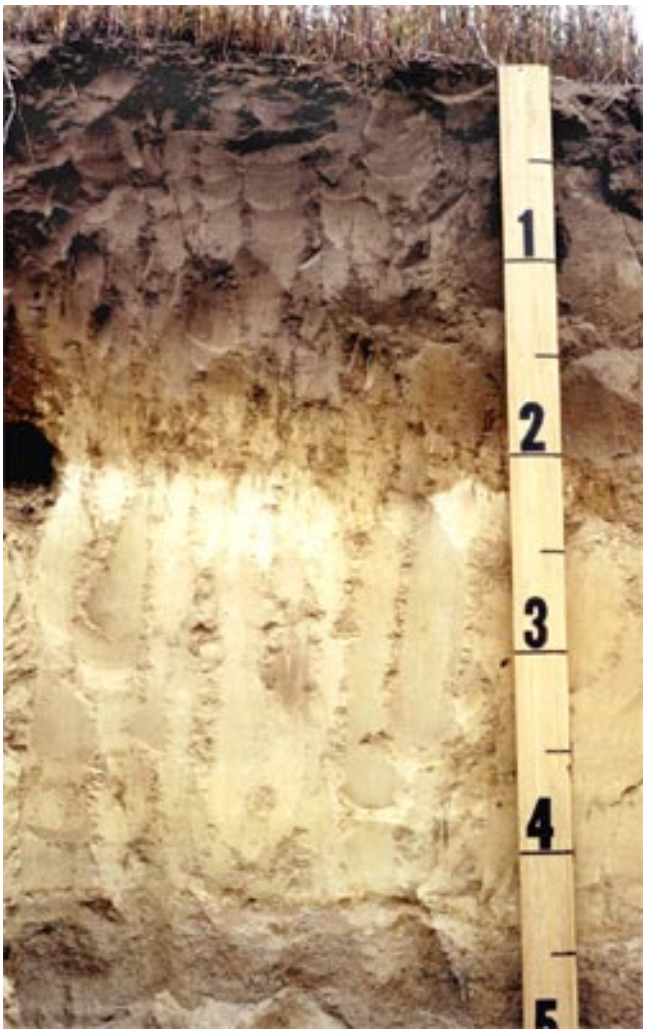


Figure 15.—Typical profile of Egeland fine sandy loam. This soil has a dark surface layer, a brown and light olive brown subsoil, and a sandy substratum. Depth is marked in feet.

Texture—fine sandy loam

Bw horizon:
Hue—10YR or 2.5Y
Value—2 to 5
Chroma—1 to 4
Texture—sandy loam or fine sandy loam in the upper part and loamy sand or loamy fine sand in the lower part

Bk horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—loamy sand, loamy fine sand, sandy loam, fine sandy loam, or loamy very fine sand

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—loamy sand, loamy fine sand, sandy loam, loamy very fine sand, very fine sandy loam, or fine sandy loam or stratified with loamy and sandy material

141B—Egeland fine sandy loam, 1 to 6 percent slopes

Composition

Egeland and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landforms: Outwash plains and moraines
Position on the landform: Summits and backslopes
Slope range: 1 to 6 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 7.0 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Clontarf and similar soils
- Fordville and similar soils
- Sandberg and similar soils
- Rothsay and similar soils
- Poorly drained soils
- Areas that have slopes of more than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

141C—Egeland fine sandy loam, 6 to 12 percent slopes

Composition

Egeland and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landforms: Outwash plains and moraines
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Clontarf and similar soils
- Zell and similar soils
- Sandberg and similar soils
- Rothsay and similar soils
- Poorly drained soils
- Areas that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

141D—Egeland fine sandy loam, 12 to 20 percent slopes

Composition

Egeland and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landforms: Outwash plains and moraines
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.5 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Clontarf and similar soils
- Zell and similar soils
- Sandberg and similar soils
- Rothsay and similar soils
- Poorly drained soils
- Areas that have slopes of more than 20 percent or less than 12 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Egglake Series

Depth class: Very deep
Drainage class: Poorly drained and very poorly drained

Permeability: Upper part—moderate or moderately rapid; lower part—moderate
Landform: Moraines
Parent material: Till
Slope range: 0 to 2 percent
Taxonomic classification: Fine-loamy, mixed, frigid Mollic Endoaqualfs

Typical Pedon

Egglake fine sandy loam, in an area of Egglake-Wykeham complex, 0 to 5 percent slopes, 640 feet east and 1,290 feet north of the southwest corner of sec. 3, T. 137 N., R. 38 W.

A—0 to 4 inches; very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium subangular blocky structure; friable; many fine and very fine roots; about 3 percent gravel; neutral; abrupt smooth boundary.

Eg—4 to 8 inches; grayish brown (2.5Y 5/2) sandy loam; weak medium platy structure; friable; common fine and very fine roots; common fine and medium prominent yellowish red (5YR 4/6) Fe concentrations; few patchy distinct very dark grayish brown (10YR 3/2) organic coatings in pores; about 3 percent gravel; neutral; abrupt wavy boundary.

Btg1—8 to 16 inches; grayish brown (2.5Y 5/2) sandy clay loam; moderate medium and coarse subangular blocky structure; firm; common fine and very fine roots; common patchy faint dark grayish brown (2.5Y 4/2) clay films on faces of peds and in pores; common fine and medium prominent yellowish red (5YR 4/6) and reddish brown (5YR 4/4) Fe concentrations; few patchy distinct very dark grayish brown (10YR 3/2) organic coatings in pores; about 5 percent gravel; neutral; clear wavy boundary.

Btg2—16 to 22 inches; light brownish gray (2.5Y 6/2) sandy loam; weak medium and coarse subangular blocky structure; friable; common fine and very fine roots; few patchy faint dark grayish brown (2.5Y 5/2) clay films on faces of peds and in pores; few medium prominent dark reddish brown (5YR 3/3) and common medium prominent reddish brown (5YR 4/4) Fe concentrations; about 5 percent gravel; neutral; clear wavy boundary.

Bkg—22 to 32 inches; light brownish gray (2.5Y 6/2) sandy loam; weak medium subangular blocky structure; friable; few fine and very fine roots; few fine prominent yellowish red (5YR 4/6) and reddish brown (5YR 4/4) Fe concentrations; common fine light gray (10YR 7/2) soft masses of carbonates; about 8 percent gravel; very slightly effervescent; slightly alkaline; gradual wavy boundary.

Cg—32 to 60 inches; light brownish gray (2.5Y 6/2) sandy loam; weak medium platy structure; friable; many coarse faint light yellowish brown (2.5Y 6/4) and common coarse prominent strong brown (7.5YR 4/6) and dark brown (7.5YR 4/4) Fe concentrations; few fine and medium light gray (10YR 7/2) soft masses of carbonates; about 10 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 20 to more than 60 inches
Content of rock fragments: 2 to 10 percent
Other features: Some pedons have a Bg or BCg horizon.

A or Ap horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—fine sandy loam

E horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—sandy loam or fine sandy loam

Btg horizon:
Hue—5Y or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—sandy clay loam, sandy loam, clay loam, or loam

Cg horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—2 to 4
Texture—sandy loam or coarse sandy loam

1200—Egglake loam

Composition

Egglake and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Flats and swales on moraines
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Loam

Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Snellman and similar soils
- Wykeham and similar soils
- Bluffton and similar soils
- Cathro and similar soils
- Areas that have stones on the surface

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1216B—Egglake-Wykeham complex, 0 to 5 percent slopes

Composition

Egglake and similar soils: About 60 percent
Wykeham and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Egglake—footslopes and toeslopes; Wykeham—flats and swales
Slope range: Egglake—0 to 2 percent; Wykeham—1 to 5 percent

Component Description

Egglake

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.0 inches
Organic matter content: Moderate

Wykeham

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.7 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Snellman and similar soils
- Bluffton and similar soils
- Cathro and similar soils
- Soils that formed in outwash
- Areas that have stones on the surface

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Epoufette Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderately rapid or rapid; lower part—very rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 2 percent
Taxonomic classification: Coarse-loamy, mixed, frigid Mollic Endoaqualfs

Typical Pedon

Epoufette sandy loam, 60 feet south and 1,720 feet east of the northwest corner of sec. 34, T. 132 N., R. 36 W.

Ap—0 to 7 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak fine and medium subangular blocky structure; friable; few very fine and fine roots; about 2 percent gravel; neutral; abrupt smooth boundary.

Btg1—7 to 14 inches; dark grayish brown (10YR 4/2) sandy loam; moderate medium subangular blocky structure; friable; few very fine and fine roots; common discontinuous faint dark gray (10YR 4/1) and few discontinuous faint very dark grayish brown (10YR 3/2) clay films on vertical and horizontal faces of peds; common fine and medium prominent strong brown (7.5YR 5/6) Fe concentrations; about 2 percent gravel; neutral; clear wavy boundary.

Btg2—14 to 23 inches; grayish brown (10YR 5/2) loamy sand; moderate medium subangular blocky structure; friable; few very fine and fine roots; few patchy faint dark grayish brown (10YR 4/2) clay films on vertical and horizontal faces of peds; common medium distinct yellowish brown (10YR 5/6) Fe concentrations; about 2 percent gravel; neutral; clear wavy boundary.

2Btg3—23 to 33 inches; light brownish gray (10YR 6/2) loamy sand; single grain; loose; very few patchy distinct dark grayish brown (10YR 4/2) clay bridges between sand grains; common medium distinct yellowish brown (10YR 5/6) Fe concentrations; about 4 percent gravel; neutral; gradual wavy boundary.

2Cg—33 to 60 inches; light brownish gray (2.5Y 6/2) sand; single grain; loose; common coarse distinct light olive brown (2.5Y 5/4) Fe concentrations; about 8 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 18 to 40 inches

Ap or A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—sandy loam
Content of rock fragments—0 to 15 percent gravel by volume

Eg horizon:
Hue—10YR to 5Y
Value—4 to 6
Chroma—1 or 2
Texture—loamy sand, sand, or coarse sand or the gravelly analogs of these textures
Content of rock fragments—5 to 25 percent gravel

Btg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—sandy loam, coarse sandy loam, sandy loam, loamy sand, loamy coarse sand, or fine sandy loam or the gravelly analogs of these textures
Content of rock fragments—5 to 25 percent gravel

2Cg horizon:
Hue—7.5YR, 10YR, 2.5Y, or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—sand, coarse sand, or loamy coarse sand or the gravelly analogs of these textures
Content of rock fragments—5 to 35 percent gravel

191—Epoufette sandy loam

Composition

Epoufette and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on pitted outwash plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 0.5 foot to 2.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.2 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Bluffcreek and similar soils
- Forada and similar soils
- Roscommon and similar soils
- Lida and similar soils

- Nidaros and similar soils
- Soils that have a loamy substratum

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Flaming Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Rapid
Landform: Lake plains
Parent material: Eolian deposits
Slope range: 0 to 3 percent
Taxonomic classification: Sandy, mixed Aquic Haploborolls

Typical Pedon

Flaming loamy fine sand, 300 feet east and 1,900 feet north of the southwest corner of sec. 29, T. 132 N., R. 44 W.

Ap—0 to 10 inches; black (10YR 2/1) loamy fine sand, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; very friable; many fine and very fine roots; neutral; abrupt smooth boundary.

A—10 to 16 inches; very dark brown (10YR 2/2) loamy fine sand, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; very friable; many fine and very fine roots; neutral; clear wavy boundary.

Bw1—16 to 30 inches; brown (10YR 4/3) loamy fine sand; weak fine subangular blocky structure; very friable; few fine and very fine roots; moderately acid; clear wavy boundary.

Bw2—30 to 38 inches; brown (10YR 4/3) fine sand; single grain; loose; few fine distinct light gray (10YR 7/1) Fe depletions and few fine prominent strong brown (7.5YR 4/6) Fe concentrations; moderately acid; clear wavy boundary.

C1—38 to 50 inches; light grayish brown (2.5Y 6/2) fine sand; single grain; loose; few fine prominent strong brown (7.5YR 4/6) Fe concentrations; moderately acid; abrupt wavy boundary.

C2—50 to 60 inches; light olive brown (2.5Y 5/3) fine sand; single grain; loose; few fine and medium distinct light olive brown (2.5Y 5/6) Fe concentrations; very slightly effervescent; neutral.

Range in Characteristics

Depth to carbonates: 20 to 60 inches
Thickness of the mollic epipedon: 10 to 16 inches
Content of rock fragments: Typically none throughout

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy fine sand

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—loamy fine sand, fine sand, loamy sand, or sand

C horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 4
Texture—fine sand or sand

66—Flaming loamy fine sand

Composition

Flaming and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on lake plains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Eolian deposits
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 5.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is

available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Foldahl and similar soils
- Arveson and similar soils
- Very poorly drained soils
- Soils that have carbonates in the surface soil

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Foldahl Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—rapid; lower part—moderately slow or moderate
Landform: Lake plains
Parent material: Glaciolacustrine deposits over till
Slope range: 0 to 3 percent
Taxonomic classification: Sandy over loamy, mixed Aquic Haploborolls

Typical Pedon

Foldahl loamy fine sand, 1,100 feet west and 150 feet south of the northeast corner of sec. 16, T. 131 N., R. 44 W.

Ap—0 to 9 inches; black (10YR 2/1) loamy fine sand, very dark gray (10YR 3/1) dry; weak fine and medium subangular blocky structure; very friable; many fine and very fine roots; neutral; abrupt smooth boundary.

A—9 to 14 inches; black (10YR 2/1) loamy fine sand, very dark gray (10YR 3/1) dry; weak fine and medium subangular blocky structure; very friable; many fine and very fine roots; neutral; clear smooth boundary.

Bw1—14 to 16 inches; very dark grayish brown (10YR 3/2) loamy fine sand, dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure; very friable; few fine and very fine roots; neutral; clear wavy boundary.

Bw2—16 to 26 inches; dark yellowish brown (10YR 4/4) fine sand; single grain; loose; about 2 percent gravel; neutral; abrupt smooth boundary.

2Bk—26 to 40 inches; light brownish gray (2.5Y 6/2) clay loam; moderate fine and medium prismatic structure parting to weak thin platy; firm; common fine and medium prominent strong brown (7.5YR 5/8) Fe concentrations; many fine irregular light gray (10YR 7/2) carbonate threads; about 10 percent gravel; violently effervescent; moderately alkaline; clear smooth boundary.

2Cg—40 to 60 inches; light grayish brown (2.5Y 6/2) clay loam; massive; firm; common fine prominent yellowish brown (10YR 5/6) Fe concentrations; few prominent black (N 2/0) iron-manganese stains; about 2 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 16 to 32 inches
Thickness of the mollic epipedon: 7 to 16 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy fine sand
Content of rock fragments—0 to 8 percent

Bw horizon:
Hue—10YR
Value—3 or 4
Chroma—2 to 4
Texture—loamy fine sand, fine sand, loamy sand, or sand
Content of rock fragments—0 to 8 percent

2Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7
Chroma—2 to 4
Texture—sandy loam, fine sandy loam, loam, silt loam, or clay loam
Content of rock fragments—2 to 15 percent

2Cg horizon:
Hue—10YR or 2.5Y
Value—5 to 7
Chroma—2 to 4
Texture—silt loam, clay loam, loam
Content of rock fragments—2 to 15 percent

426—Foldahl loamy fine sand

Composition

Foldahl and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on lake plains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Flaming and similar soils
- Rockwell and similar soils
- Soils that are underlain by outwash
- Soils that have carbonates above the subsoil

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Forada Series

Depth class: Very deep
Drainage class: Poorly drained and very poorly drained
Permeability: Upper part—moderate; next part—moderately rapid; lower part—rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 1 percent
Taxonomic classification: Coarse-loamy, mixed, frigid Typic Endoaquolls

Typical Pedon

Forada loam, 1,750 feet east and 200 feet south of the northwest corner of sec. 29, T. 134 N., R. 44 W.

Ap—0 to 8 inches; black (N 2/0) loam, very dark gray (N 3/0) dry; weak fine and medium subangular blocky structure; friable; few fine and medium roots; common fine prominent strong brown (7.5YR 5/6) Fe concentrations; about 1 percent gravel; neutral; abrupt smooth boundary.

A—8 to 18 inches; black (N 2/0) loam, dark gray (N 4/0) dry; weak fine and medium subangular blocky structure; friable; few fine and medium roots; common fine prominent strong brown (7.5YR 5/6) Fe concentrations; about 1 percent gravel; neutral; gradual wavy boundary.

Bg1—18 to 25 inches; dark gray (5Y 4/1) loam; moderate fine and medium subangular blocky structure; friable; common very fine and fine roots; common fine and medium prominent strong brown (7.5YR 4/6) Fe concentrations; about 3 percent gravel; neutral; clear smooth boundary.

Bg2—25 to 32 inches; dark grayish brown (2.5Y 4/2) sandy loam; weak fine subangular blocky structure; very friable; few very fine and fine roots; common fine distinct gray (5Y 5/1) Fe depletions and few medium prominent brown (7.5YR 4/4) Fe concentrations; about 4 percent gravel; neutral; clear smooth boundary.

Bg3—32 to 36 inches; grayish brown (2.5Y 5/2) sandy loam; weak very fine and fine subangular blocky structure; very friable; few very fine and fine roots; common medium distinct light olive brown (2.5Y 5/4) and common medium faint olive brown (2.5Y 4/3) Fe concentrations; about 10 percent gravel; neutral; clear smooth boundary.

2Cg—36 to 60 inches; light olive brown (2.5Y 5/4) gravelly coarse sand; single grain; loose; common fine prominent yellowish brown (10YR 5/6) Fe concentrations; about 15 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 20 to 50 inches
Thickness of the mollic epipedon: 10 to 24 inches
Thickness of the loamy mantle: 20 to 40 inches

Ap or A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—loam
Content of rock fragments—0 to 10 percent

Bg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—sandy loam or loam; subhorizons of

sandy clay loam, loamy sand, or loamy coarse sand
Content of rock fragments—0 to 10 percent

2Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 to 6
Texture—sand, coarse sand, or the gravelly analogs of these textures
Content of rock fragments—0 to 35 percent

375—Forada loam

Composition

Forada and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on pitted outwash plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Oylen and similar soils
- Leafriver and similar soils
- Nidaros and similar soils
- Arvilla and similar soils
- Egeland and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1077—Forada and Leafriver soils, depressional

Composition

Forada: Variable
Leafriver: Variable
Inclusions: About 10 percent

Setting

Landform: Depressions on pitted outwash plains
Slope range: 0 to 1 percent

Component Description

Forada

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Glacial outwash
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 6.1 inches
Organic matter content: Very high

Leafriver

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials over outwash
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 8.2 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Dorset and similar soils
- Hubbard and similar soils
- Oylen and similar soils
- Isan and similar soils
- Pinelake and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Fordville Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderate; lower part—rapid or very rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 3 percent
Taxonomic classification: Fine-loamy over sandy or sandy-skeletal, mixed Pachic Udic Haploborolls

Typical Pedon

Fordville loam, 1,250 feet east and 2,050 feet north of the southwest corner of sec. 20, T. 134 N., R. 40 W.

Ap—0 to 10 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; common medium roots; about 2 percent gravel; neutral; abrupt smooth boundary.
A—10 to 22 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; common fine roots; about 2 percent gravel; neutral; gradual wavy boundary.
Bw1—22 to 29 inches; very dark brown (10YR 2/2) loam, very dark grayish brown (10YR 3/2) dry; weak very fine and fine subangular blocky structure; friable; few fine roots; about 3 percent gravel; neutral; clear wavy boundary.
Bw2—29 to 37 inches; brown (10YR 4/3) loam; weak medium subangular blocky structure; friable; few fine roots; about 5 percent gravel; neutral; clear wavy boundary.
2C1—37 to 55 inches; brown (10YR 4/3) gravelly coarse sand; single grain; loose; about 20 percent gravel; slightly effervescent; slightly alkaline; gradual wavy boundary.
2C2—55 to 60 inches; olive brown (2.5Y 4/4) gravelly coarse sand; single grain; loose; about 30 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to 40 inches
Thickness of the mollic epipedon: 16 to 30 inches
Thickness of the loamy mantle: 20 to 40 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam
Content of rock fragments—0 to 15 percent

Bw horizon:
Hue—10YR
Value—2 to 4
Chroma—2 to 4
Texture—loam or silt loam
Content of rock fragments—0 to 15 percent

2C horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—2 to 4
Texture—loamy sand, gravelly loamy sand, gravelly sand, gravelly coarse sand, very gravelly sand, or very gravelly loamy sand
Content of rock fragments—5 to 35 percent

339—Fordville loam

Composition

Fordville and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Footslopes and toeslopes
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 7.8 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Arvilla and similar soils
- Clontarf and similar soils

- Forada and similar soils
- Leafriver and similar soils
- Areas that have slopes of more than 3 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Forman Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderate; lower part—moderately slow
Landform: Moraines
Parent material: Till
Slope range: 2 to 20 percent
Taxonomic classification: Fine-loamy, mixed Udic Argiborolls

Typical Pedon

Forman clay loam, 2 to 6 percent slopes, 2,300 feet north and 2,500 feet east of the southwest corner of sec. 27, T. 133 N., R. 42 W.

Ap—0 to 9 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; few fine and very fine roots; about 2 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—9 to 12 inches; very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium subangular blocky structure; friable; few fine and very fine roots; common discontinuous faint very dark gray (10YR 3/1) clay films on faces of peds and in pores; about 2 percent gravel; slightly acid; clear smooth boundary.

Bt2—12 to 24 inches; brown (10YR 4/3) clay loam; moderate fine and medium subangular blocky structure; firm; few fine and very fine roots; common discontinuous faint very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; about 2 percent gravel; neutral; clear smooth boundary.

Bk—24 to 38 inches; light yellowish brown (10YR 6/4) loam; weak medium subangular blocky structure; friable; few very fine roots; many distinct light gray (10YR 7/2) carbonate coatings on faces of peds and many fine and medium irregular light gray (10YR 7/2) soft masses of carbonates in ped interiors; about 3 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

C—38 to 60 inches; light olive brown (2.5Y 5/4) loam; massive; friable; many fine rounded iron-manganese concretions; common fine and medium distinct grayish brown (2.5Y 5/2) relict Fe depletions; about 3 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 12 to 27 inches
Thickness of the mollic epipedon: 9 to 16 inches
Content of rock fragments: 2 to 10 percent throughout

Ap or A horizon:
Hue—10YR
Value—2
Chroma—1
Texture—clay loam

Bt horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—1 to 4
Texture—clay loam or loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 to 5
Texture—loam or clay loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 to 5
Texture—loam or clay loam

168B—Forman clay loam, 2 to 6 percent slopes

Composition

Forman and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Clay loam

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Gonvick and similar soils
- Parnell and similar soils
- Buse and similar soils
- Roliss and similar soils
- Poorly drained soils
- Areas that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

915C2—Forman-Buse complex, 6 to 12 percent slopes, eroded

Composition

Forman and similar soils: About 60 percent
Buse and similar soils: About 25 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Forman

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: High

Buse

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Gonvick and similar soils
- Peever and similar soils
- Parnell and similar soils
- Cathro and similar soils
- Areas that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

915D2—Forman-Buse complex, 12 to 20 percent slopes, eroded

Composition

Forman and similar soils: About 50 percent
Buse and similar soils: About 35 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders

Slope range: 12 to 20 percent

Component Description

Forman

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: High

Buse

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Gonvick and similar soils
- Peever and similar soils
- Parnell and similar soils
- Cathro and similar soils
- Areas that have slopes of more than 20 percent or less than 12 percent
- Areas that have stones on the surface

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Formdale Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderate; lower part—moderately slow
Landform: Moraines
Parent material: Till
Slope range: 2 to 20 percent
Taxonomic classification: Fine-loamy, mixed Udic Haploborolls

Typical Pedon

Formdale clay loam, in an area of Formdale-Buse complex, 2 to 6 percent slopes, 200 feet west and 2,000 feet north of the southeast corner of sec. 29, T. 131 N., R. 43 W.

Ap—0 to 7 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; moderate very fine subangular blocky structure; firm; many fine roots; about 2 percent gravel; neutral; abrupt smooth boundary.

A—7 to 11 inches; very dark brown (10YR 2/2) clay loam, very dark gray (10YR 3/1) dry; moderate very fine subangular blocky structure; firm; few fine roots; about 2 percent gravel; neutral; clear smooth boundary.

Bw1—11 to 14 inches; dark brown (10YR 3/3) clay loam, brown (10YR 4/3) dry; moderate medium prismatic structure grading to weak fine subangular blocky; firm; few fine roots; about 2 percent gravel; neutral; clear wavy boundary.

Bw2—14 to 18 inches; brown (10YR 4/3) clay loam; moderate medium prismatic structure parting to weak fine subangular blocky; firm; few fine roots; about 2 percent gravel; clear wavy boundary.

Bk—18 to 30 inches; yellowish brown (10YR 5/4) loam; weak fine subangular blocky structure; friable; few fine roots; common fine irregular light gray (10YR 7/2) carbonate threads; about 2 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

C—30 to 60 inches; light olive brown (2.5Y 5/4) clay loam; massive; friable; common medium prominent grayish brown (10YR 5/2) relict Fe depletions; few fine irregular light gray (10YR 7/2) carbonate threads; about 2 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 8 to 20 inches
Thickness of the mollic epipedon: 8 to 14 inches

Content of rock fragments: 2 to 8 percent throughout

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—clay loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—3 or 4
Texture—clay loam, silty clay loam, or loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 or 4
Texture—clay loam, loam, or silty clay loam

C horizon:
Hue—2.5Y
Value—5 or 6
Chroma—3 to 6
Texture—clay loam, loam, or silty clay loam

931C2—Formdale-Langhei complex, 6 to 12 percent slopes, eroded

Composition

Formdale and similar soils: About 55 percent
Langhei and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Formdale

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.2 inches
Organic matter content: Moderate

Langhei

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Aazdahl and similar soils
- Hamerly and similar soils
- Parnell and similar soils
- Roliss and similar soils
- Areas that have slopes of more than 12 percent or less than 6 percent
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

931D2—Formdale-Langhei complex, 12 to 20 percent slopes, eroded

Composition

Formdale and similar soils: About 50 percent
Langhei and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Formdale

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

Langhei

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Aazdahl and similar soils
- Hamerly and similar soils
- Parnell and similar soils
- Roliss and similar soils
- Areas that have slopes of more than 20 percent or less than 12 percent
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1234B—Formdale-Buse complex, 2 to 6 percent slopes

Composition

Formdale and similar soils: About 60 percent
Buse and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: Formdale—2 to 6 percent; Buse—3 to 6 percent

Component Description

Formdale

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.2 inches
Organic matter content: Moderate

Buse

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Aazdahl and similar soils
- Hamerly and similar soils
- Parnell and similar soils
- Roliss and similar soils
- Areas that have slopes of more than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Foxhome Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderately rapid; next part—moderately rapid or rapid; lower part—moderate

Landform: Lake plains
Parent material: Glaciolacustrine deposits over till
Slope range: 0 to 3 percent
Taxonomic classification: Sandy-skeletal over loamy, mixed Aquic Haploborolls

Typical Pedon

Foxhome sandy loam, 2,550 feet north and 240 feet west of the southeast corner of sec. 31, T. 131 N., R. 44 W.

Ap—0 to 10 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak fine and very fine subangular blocky structure; friable; common very fine and fine roots; about 4 percent gravel; neutral; abrupt smooth boundary.

A—10 to 13 inches; very dark brown (10YR 2/2) sandy loam, very dark grayish brown (10YR 3/2) dry; weak fine and very fine subangular blocky structure; friable; common very fine and fine roots; about 8 percent gravel; neutral; clear smooth boundary.

Bw—13 to 16 inches; dark brown (10YR 3/3) loamy sand, brown (10YR 4/3) dry; weak fine and very fine subangular blocky structure; very friable; few fine and very fine roots; about 12 percent gravel; neutral; clear smooth boundary.

2Bk1—16 to 21 inches; light olive brown (2.5Y 5/3) very gravelly coarse sand; single grain; loose; few discontinuous distinct light gray (2.5Y 7/2) carbonate coatings on pebbles; carbonates disseminated throughout; about 50 percent gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

2Bk2—21 to 27 inches; light yellowish brown (2.5Y 6/3) very gravelly coarse sand; single grain; loose; few discontinuous faint light gray (2.5Y 7/2) carbonate coatings on pebbles; carbonates disseminated throughout; about 35 percent gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

2Bk3—27 to 35 inches; light olive brown (2.5Y 5/4) very gravelly coarse sand; common medium and coarse strong brown (7.5YR 5/6) Fe concentrations; single grain; loose; few discontinuous distinct light gray (2.5Y 7/2) carbonate coatings on pebbles; about 45 percent gravel; slightly effervescent; slightly alkaline; clear smooth boundary.

3Bk4—35 to 60 inches; light olive brown (2.5Y 5/4) clay loam; weak coarse prismatic soil fragments; firm; common fine and medium prominent yellowish brown (10YR 5/6) Fe concentrations and common fine medium distinct grayish brown (2.5Y 5/2) Fe depletions; common fine light gray (10YR 7/2) cylindrical carbonate threads; about 3 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 11 to 30 inches
Thickness of the mollic epipedon: 7 to 16 inches
Depth to glacial till: 20 to 50 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam
Content of rock fragments—0 to 15 percent gravel, 0 to 5 percent cobbles

Bw horizon:
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—sandy loam, loamy sand, or loam or the gravelly analogs of these textures
Content of rock fragments—0 to 20 percent

2Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loamy sand, sand, coarse sand, or loamy coarse sand or the very gravelly or extremely gravelly analogs of these textures
Content of rock fragments—35 to 75 percent

3Bk horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—2 or 3
Texture—clay loam or loam
Content of rock fragments—1 to 15 percent

65—Foxhome sandy loam

Composition

Foxhome and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Rises on lake plains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)

Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 7.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Foldahl and similar soils
- Grimstad and similar soils
- Hamerly and similar soils
- Kittson and similar soils
- Poorly drained soils
- Very poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Friberg Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderate
Landform: Moraines
Parent material: Colluvium over till
Slope range: 0 to 2 percent
Taxonomic classification: Fine-loamy, mixed, frigid Typic Argiaquolls

Typical Pedon

Friberg loam, in an area of Friberg-Weetown complex, 1,650 feet west and 300 feet south of the northeast corner of sec. 6, T. 133 N., R. 41 W.

Ap—0 to 9 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; friable; common and many fine and medium roots; about 1 percent gravel; neutral; abrupt smooth boundary.

A—9 to 19 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure; friable; common and many fine and medium roots; about 1 percent gravel; neutral; clear wavy boundary.

Btg1—19 to 24 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; firm; few fine roots; common continuous faint black (10YR 2/1) clay films on faces of peds; about 1 percent gravel; neutral; clear wavy boundary.

2Btg2—24 to 41 inches; grayish brown (2.5Y 5/2) sandy clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common medium distinct light olive brown (2.5Y 5/6) Fe concentrations; common continuous prominent very dark gray (10YR 3/1) clay films on faces of peds, in old root channels, and in pores; about 5 percent gravel; neutral; gradual wavy boundary.

2Btg3—41 to 47 inches; grayish brown (2.5Y 5/2) sandy clay loam; weak coarse prismatic structure parting to weak medium subangular blocky; firm; common medium distinct light olive brown (2.5Y 5/6) Fe concentrations; few patchy prominent very dark gray (10YR 3/1) clay films on faces of peds, in old root channels, and in pores; about 3 percent gravel; neutral; clear wavy boundary.

2Cg—47 to 80 inches; grayish brown (2.5Y 5/2) fine sandy loam; massive; friable; many medium prominent yellowish brown (10YR 5/8) Fe concentrations; few distinct black organic coatings in old root channels and in pores; about 6 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to 65 inches
Thickness of the mollic epipedon: 16 to 42 inches
Content of rock fragments: 1 to 8 percent

Ap or A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—loam

Btg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—2 to 5
Chroma—1 or 2
Texture—silty clay loam or clay loam

2Btg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—2 to 5
Chroma—1 or 2

Texture—sandy clay loam or loam

2Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 8
Texture—fine sandy loam, loam, sandy loam, or sandy clay loam

710—Friberg-Weetown complex

Composition

Friberg and similar soils: About 50 percent
Weetown and similar soils: About 40 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Friberg—swales; Weetown—footslopes and toeslopes
Slope range: Friberg—0 to 2 percent; Weetown—1 to 3 percent

Component Description

Friberg

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Colluvium over till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.9 inches
Organic matter content: High

Weetown

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Colluvium over till
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.6 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Chapett and similar soils
- Quam and similar soils
- Bluffton and similar soils
- Parnell and similar soils
- Cathro and similar soils
- Brandsvold and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Glyndon Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Upper part—moderate; next part—moderate or moderately rapid; lower part—moderately rapid
Landform: Lake plains
Parent material: Glaciolacustrine deposits
Slope range: 0 to 2 percent
Taxonomic classification: Coarse-silty, frigid Aeric Calciaquolls

Typical Pedon

Glyndon very fine sandy loam, 1,100 feet north and 220 feet east of the southwest corner of sec. 18, T. 132 N., R. 44 W.

Ap—0 to 10 inches; black (10YR 2/1) very fine sandy loam, very dark gray (10YR 3/1) dry; weak fine and very fine subangular blocky structure; friable; common fine and very fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Ak—10 to 16 inches; very dark gray (10YR 3/1) loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; common fine roots; carbonates disseminated throughout; violently effervescent; moderately alkaline; clear smooth boundary.

Bk—16 to 24 inches; dark gray (10YR 4/1) loam; weak fine and medium subangular blocky structure; friable; common very fine roots; common fine irregular light gray (10YR 7/2) carbonate threads; violently effervescent; moderately alkaline; clear smooth boundary.

Bkg—24 to 29 inches; grayish brown (2.5Y 5/2) very

fine sandy loam; weak fine and medium subangular blocky structure; friable; few very fine roots; few fine distinct light olive brown (2.5Y 5/4) Fe concentrations; carbonates disseminated throughout; strongly effervescent; moderately alkaline; clear smooth boundary.

Cg1—29 to 45 inches; grayish brown (2.5Y 5/2) loamy very fine sand; massive; very friable; many fine and medium distinct light olive brown (2.5Y 5/6) Fe concentrations; common patchy prominent strong brown (7.5YR 4/6) iron stains on faces of peds and in pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Cg2—45 to 60 inches; olive (5Y 5/3) loamy very fine sand; massive; very friable; common fine and medium faint light olive gray (5Y 6/2) Fe depletions and many medium and coarse prominent strong brown (7.5YR 5/6) Fe concentrations; common patchy distinct dark brown (7.5YR 3/4) iron stains on faces of peds and in pores; slightly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: At or near the surface
Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: Typically none throughout

Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—very fine sandy loam

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam, loam, silt loam, sandy clay loam, or silty clay loam

Bk horizon:
Hue—10YR to 5Y
Value—4 to 7
Chroma—1 to 4
Texture—silt loam, very fine sandy loam, loam, silty clay loam, or sandy clay loam

C horizon:
Hue—10YR to 5Y
Value—4 to 6
Chroma—2 to 4
Texture—silt loam, very fine sandy loam, loam, loamy very fine sand, or very fine sand

1304A—Glyndon very fine sandy loam

Composition

Glyndon and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on lake plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Very fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 1.5 to 2.5 feet
Available water capacity to 60 inches or root-limiting layer: About 11.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Borup and similar soils
- Very poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Gonvick Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate or moderately slow
Landform: Moraines
Parent material: Till
Slope range: 1 to 3 percent
Taxonomic classification: Fine-loamy, mixed Aquic Argiborolls

Typical Pedon

Gonvick loam, 200 feet west and 1,600 feet north of the southeast corner of sec. 24, T. 132 N., R. 42 W.

Ap—0 to 8 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; friable; common very fine and fine roots; about 3 percent gravel; neutral; abrupt smooth boundary.

A—8 to 15 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; friable; common very fine and fine roots; about 3 percent gravel; neutral; clear wavy boundary.

Bt1—15 to 25 inches; dark grayish brown (2.5Y 4/2) clay loam; strong medium subangular blocky structure; firm; common very fine and fine roots; common continuous prominent black (10YR 2/1) and common continuous prominent very dark gray (10YR 3/1) clay films on faces of peds; about 3 percent gravel; neutral; clear wavy boundary.

Bt2—25 to 35 inches; dark grayish brown (2.5Y 4/2) clay loam; moderate medium subangular blocky structure; firm; common very fine and fine roots; common continuous distinct very dark gray (10YR 3/1) and few continuous prominent black (10YR 2/1) clay films on faces of peds; common fine and medium distinct light olive brown (2.5Y 5/6) Fe concentrations; about 3 percent gravel; neutral; clear wavy boundary.

Bk—35 to 47 inches; light olive brown (2.5Y 5/4) loam; weak fine and medium subangular blocky structure; friable; many fine and medium prominent gray (10YR 5/1) Fe depletions and few fine prominent yellowish brown (10YR 5/6) Fe concentrations; common soft masses of iron-manganese; common light gray (10YR 7/2) soft masses of carbonates; about 5 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—47 to 60 inches; light olive brown (2.5Y 5/4) loam; massive; friable; many medium and coarse distinct grayish brown (2.5Y 5/2) Fe depletions and common medium distinct light olive brown (2.5Y 5/6) Fe concentrations; about 5 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to 38 inches
Thickness of the mollic epipedon: 8 to 16 inches
Content of rock fragments: 2 to 8 percent throughout

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—loam

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—loam or clay loam

Bk horizon:
Hue—2.5Y or 10YR
Value—5 or 6
Chroma—2 to 4
Texture—loam

C horizon:
Hue—2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—loam or clay loam

180—Gonvick loam

Composition

Gonvick and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Footslopes and toeslopes
Slope range: 1 to 3 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.8 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Forman and similar soils
- Parnell and similar soils
- Buse and similar soils
- Roliss and similar soils

- Poorly drained soils
- Areas that have slopes of more than 3 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Grimstad Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderately rapid; next part—rapid; lower part—moderate
Landform: Lake plains
Parent material: Glaciolacustrine deposits over glacial till
Slope range: 0 to 3 percent
Taxonomic classification: Sandy over loamy, frigid Aeric Calciaquolls

Typical Pedon

Grimstad fine sandy loam, 2,250 feet east and 180 feet south of the northwest corner of sec. 30, T. 133 N., R. 44 W.

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

Bk1—10 to 15 inches; dark grayish brown (2.5Y 4/2) loamy fine sand; weak fine subangular blocky structure; friable; few fine and very fine roots; few faint light brownish gray (2.5Y 6/2) carbonate coatings on faces of peds; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—15 to 27 inches; dark grayish brown (2.5Y 4/2) loamy fine sand; single grain; loose; few faint light brownish gray (2.5Y 6/2) carbonate coatings on faces of peds; about 1 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

C1—27 to 38 inches; light olive brown (2.5Y 5/4) loamy sand; single grain; loose; few fine distinct grayish brown (2.5Y 5/2) Fe depletions; slightly effervescent; moderately alkaline; clear wavy boundary.

2C2—38 to 60 inches; light olive brown (2.5Y 5/4) clay loam; massive; firm; common medium distinct grayish brown (2.5Y 5/2) and common medium prominent strong brown (7.5YR 4/6) Fe concentrations; about 3 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Carbonates: At or near the surface
Thickness of the mollic epipedon: 7 to 16 inches
Depth to glacial till: 20 to 40 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 to 3
Texture—loamy sand, loamy fine sand, or loamy very fine sand

C horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—sand, fine sand, very fine sand, loamy sand, loamy fine sand, or loamy very fine sand

2C horizon:
Hue—2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—clay loam, silt loam, or silty clay loam
Content of rock fragments—1 to 10 percent

59—Grimstad fine sandy loam

Composition

Grimstad and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on lake plains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits over till

Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Rockwell and similar soils
- Foldahl and similar soils
- Soils that have a leached surface layer

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Hamerly Series

Depth class: Very deep
Drainage class: Moderately well drained and somewhat poorly drained
Permeability: Upper part—moderate; lower part—moderate or moderately slow
Landforms: Lake plains and moraines
Parent material: Till
Slope range: 0 to 3 percent
Taxonomic classification: Fine-loamy, frigid Aeric Calciaquolls

Typical Pedon

Hamerly clay loam, in an area of Hamerly-Mustinka complex, 2,450 feet north and 700 feet west of the southeast corner of sec. 31, T. 131 N., R. 44 W.

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 fine roots; about 2 percent gravel; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Bky1—8 to 14 inches; olive (5Y 5/3) clay loam; weak medium subangular blocky structure; friable; common fine roots; common fine rounded light gray (10YR 7/2) soft masses of carbonates; common fine cylindrical gypsum crystals; about 2 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

Bky2—14 to 22 inches; olive gray (5Y 5/2) clay loam; weak medium subangular blocky structure; friable; few fine and very fine roots; common fine rounded light gray (10YR 7/2) soft masses of carbonates; common fine cylindrical gypsum crystals; about 2 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

Bky3—22 to 40 inches; light olive brown (2.5Y 5/4) clay loam; weak medium subangular blocky structure; firm; few very fine roots; few fine distinct grayish brown (2.5Y 5/2) Fe depletions and few fine distinct light olive brown (2.5Y 5/6) Fe concentrations; common fine light gray (10YR 7/2) masses of carbonates; common fine cylindrical gypsum crystals; few soft shale fragments; about 2 percent gravel; slightly effervescent; slightly alkaline; gradual wavy boundary.

C—40 to 60 inches; light olive brown (2.5Y 5/4) clay loam; weak medium and coarse prismatic soil fragments; firm; common medium distinct grayish brown (2.5Y 5/2) Fe depletions and common fine prominent yellowish brown (10YR 5/6) Fe concentrations; about 2 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: At or near the surface
Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: 1 to 10 percent

A horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—clay loam or loam

Bky horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 7
Chroma—1 to 4
Texture—loam or clay loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 to 4
Texture—loam or clay loam

184—Hamerly loam

Composition

Hamerly and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Flats and rises on moraines
Slope range: 1 to 3 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2 to 4 feet
Available water capacity to 60 inches or root-limiting layer: About 10.6 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Barnes and similar soils
- Parnell and similar soils
- Roliss and similar soils
- Poorly drained soils
- Soils in which carbonates have been leached to the subsoil
- Areas that have slopes of more than 3 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1149—Hamerly clay loam

Composition

Hamerly and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landforms: Flats on lake plains and moraines
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 1.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.2 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Aazdahl and similar soils
- Doran and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1259—Hamerly-Mustinka complex

Composition

Hamerly and similar soils: About 60 percent
Mustinka and similar soils: About 25 percent
Inclusions: About 15 percent

Setting

Landform: Lake plains
Position on the landform: Hamerly—slight rises; Mustinka—flats and swales
Slope range: Hamerly—0 to 2 percent; Mustinka—0 to 1 percent

Component Description

Hamerly

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 1.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.2 inches
Organic matter content: High

Mustinka

Texture of the surface layer: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Seasonal high water table: At the surface to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Foldahl and similar soils
- Aazdahl and similar soils
- Doran and similar soils
- Haug and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Hangaard Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderately rapid or rapid; lower part—rapid or very rapid
Landform: Lakeshores
Parent material: Beach deposits
Slope range: 0 to 2 percent
Taxonomic classification: Sandy, mixed, frigid Typic Endoaquolls
Taxadjunct features: The surface layer of the Hangaard soils in this county is loamy sand and is thinner than is defined as the range for the series.

Typical Pedon

Hangaard loamy sand, lake beaches, 7,525 feet east and 325 feet south of the northwest corner of sec. 7, T. 134 N., R. 39 W.

A1—0 to 5 inches; black (10YR 2/1) loamy sand, very dark grayish brown (10YR 3/2) dry; weak medium subangular blocky structure; loose; few fine and medium roots; slightly acid; clear smooth boundary.
A2—5 to 8 inches; very dark grayish brown (10YR 3/2) sand, dark grayish brown (10YR 4/2) dry; single grain; loose; few fine and medium roots; slightly acid; clear smooth boundary.
Cg1—8 to 23 inches; dark brownish gray (2.5Y 4/2) sand; single grain; loose; few fine and medium roots; common coarse prominent dark yellowish brown (10YR 4/4) Fe concentrations; about 5 percent gravel; neutral; clear smooth boundary.
Cg2—23 to 28 inches; grayish brown (2.5Y 5/2) sand; single grain; loose; many medium and coarse prominent dark yellowish brown (10YR 4/4) Fe concentrations; about 5 percent gravel; neutral; clear smooth boundary.
Cg3—28 to 36 inches; grayish brown (10YR 5/2) gravelly coarse sand; single grain; loose; about 18 percent gravel; neutral; clear smooth boundary.
Cg4—36 to 46 inches; dark grayish brown (10YR 4/2) coarse sand; single grain; loose; about 10 percent gravel; neutral; clear smooth boundary.
Cg5—46 to 60 inches; light brownish gray (10YR 6/2) gravelly coarse sand; single grain; loose; about 19 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 46 inches

A or Ap horizon:
Hue—7.5YR, 10YR, or neutral
Value—2 to 4
Chroma—0 to 2
Texture—loamy sand
Content of rock fragments—0 to 15 percent

Cg horizon:
Hue—7.5YR to 5Y or neutral
Value—4 to 7
Chroma—0 to 2
Texture—fine sand, sand, loamy sand, loamy fine sand, gravelly sand, gravelly loamy sand, or stratified gravel and coarse sand
Content of rock fragments—5 to 35 percent

1114—Hangaard loamy sand, lake beaches

Composition

Hangaard and similar soils: About 85 percent

Inclusions: About 15 percent

Setting

Landform: Lakeshores
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Beach deposits
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 2.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Corliss and similar soils
- Rushlake and similar soils
- Leafriver and similar soils

Major Uses of the Unit

- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Hantho Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate slow or moderate; lower part—moderate
Landform: Moraines
Parent material: Glaciolacustrine deposits
Slope range: 1 to 3 percent
Taxonomic classification: Coarse-silty, mixed Pachic Udic Haploborolls

Typical Pedon

Hantho silt loam, 1,400 feet south and 350 feet west of the northeast corner of sec. 7, T. 134 N., R. 44 W.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; friable; many fine roots; neutral; abrupt smooth boundary.

A—9 to 22 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; friable; many fine roots; neutral; clear wavy boundary.

Bw1—22 to 27 inches; brown (10YR 4/3) silt loam; moderate medium prismatic structure; friable; few fine roots; neutral; clear wavy boundary.

Bw2—27 to 31 inches; brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; few fine roots; neutral; clear wavy boundary.

Bk—31 to 43 inches; light olive brown (2.5Y 5/4) silt loam; moderate medium platy structure parting to weak fine subangular blocky; friable; few fine distinct grayish brown (2.5Y 5/2) Fe depletions and few fine distinct light olive brown (2.5Y 5/6) Fe concentrations; common fine irregular light gray (10YR 7/2) carbonate threads; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—43 to 60 inches; light olive brown (2.5Y 5/4) silt loam; weak thin plate-like soil fragments; friable; common medium distinct grayish brown (2.5Y 5/2) Fe depletions and coarse medium prominent yellowish brown (10YR 5/6) Fe concentrations; few fine irregular light gray (10YR 7/2) carbonate threads; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 14 to 32 inches
Thickness of the mollic epipedon: 16 to 24 inches
Content of rock fragments: 0 to 2 percent throughout

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—2 or 3
Texture—silt loam or very fine sandy loam

Bk horizon:
Hue—2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—silt loam, very fine sandy loam, or loam

C horizon:
Hue—2.5Y
Value—4 to 6

Chroma—2 to 6
Texture—silt loam, very fine sandy loam, or loam

497—Hantho silt loam

Composition

Hantho and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Swales on moraines
Position on the landform: Toeslopes
Slope range: 1 to 3 percent

Component Description

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 12.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lakepark and similar soils
- Lizzie and similar soils
- Rothsay and similar soils
- Soils that have carbonates above the subsoil
- Very poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Haslie Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Upper part—moderate or moderately rapid; lower part—slow or moderately slow
Landforms: Outwash plains, moraines, and lake plains
Parent material: Organic materials and coprogenous earth
Slope range: 0 to 1 percent
Taxonomic classification: Coprogenous, euic Limnic Borosaprists

Typical Pedon

Haslie muck, 2,200 feet west and 2,100 feet south of the northeast corner of sec. 12, T. 133 N., R. 38 W.

Oa1—0 to 21 inches; muck (sapric material), black (10YR 2/1) broken face and very dark brown (10YR 2/2) rubbed; about 20 percent fiber, 3 percent rubbed; moderate medium granular structure; very friable; common fine and medium roots; very few small shells; very slightly effervescent; slightly alkaline; clear wavy boundary.

Oa2—21 to 24 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 10 percent fiber, 1 percent rubbed; weak medium subangular blocky structure; very friable; few small shells; strongly effervescent; slightly alkaline; clear wavy boundary.

Cg1—24 to 50 inches; brown (10YR 4/3) and dark grayish brown (2.5Y 4/2) mucky silt loam (coprogenous earth); weak fine subangular blocky structure; very friable; few small shells; violently effervescent; moderately alkaline; clear wavy boundary.

Cg2—50 to 60 inches; very dark gray (5Y 3/1) and dark gray (5Y 4/1) mucky silt loam (coprogenous earth); few small shells; violently effervescent; moderately alkaline.

Range in Characteristics

Depth to coprogenous earth: 16 to 50 inches

Oa horizon:
Hue—10YR, 7.5YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 to 3
Texture—muck

Cg horizon:
Hue—10YR, 5Y, 2.5Y, or neutral
Value—2 to 6
Chroma—0 to 3
Texture—mucky silt loam or mucky silty clay loam

746—Haslie muck

Composition

Haslie and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landforms: Depressions on lake plains and moraines
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials and coprogenous earth
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 17.5 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Epoufette and similar soils
- Egglake and similar soils
- Bluffton and similar soils
- Bluffcreek and similar soils
- Wykeham and similar soils

Major Uses of the Unit

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1113—Haslie, Seelyeville, and Cathro soils, ponded

Composition

Haslie: Variable
Seelyeville: Variable
Cathro: Variable
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines
Slope range: 0 to 1 percent

Component Description

Haslie

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials and coprogenous earth
Flooding: None
Seasonal high water table: At the surface to 3 feet above the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 21.6 inches
Organic matter content: Very high

Seelyeville

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials
Flooding: None
Seasonal high water table: At the surface to 3 feet above the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 24.0 inches
Organic matter content: Very high

Cathro

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials over glaciolacustrine deposits or till
Flooding: None
Seasonal high water table: 4.0 feet above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 20.0 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Kandota and similar soils
- Knute and similar soils
- Brandsvold and similar soils
- Bluffton and similar soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

1230—Haslie and Nidaros soils, ponded

Composition

Haslie and similar soils: About 45 percent
Nidaros and similar soils: About 45 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on outwash plains
Slope range: 0 to 1 percent

Component Description

Haslie

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials and coprogenous earth
Flooding: None
Seasonal high water table: At the surface to 3 feet above the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 21.6 inches
Organic matter content: Very high

Nidaros

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials over outwash
Flooding: None
Seasonal high water table: At the surface to 3 feet above the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 18.3 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Hangaard and similar soils
- Pinelake and similar soils
- Leafriver and similar soils
- Rushlake and similar soils
- Corliss and similar soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

Haug Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Upper part—moderate or moderately rapid; lower part—moderate
Landform: Lake plains
Parent material: Organic materials over till
Slope range: 0 to 1 percent
Taxonomic classification: Coarse-loamy, mixed (calcareous), frigid Histic Humaquepts

Typical Pedon

Haug muck, 1,050 feet east and 700 feet north of the southwest corner of sec. 19, T. 135 N., R. 46 W., in Wilkin County, Minnesota:

Oa—0 to 14 inches; black (10YR 2/1) muck; about 20 percent fiber unrubbed, 2 percent rubbed; weak very fine granular structure; very friable; slightly effervescent; slightly alkaline; gradual smooth boundary.

A—14 to 20 inches; very dark gray (5Y 3/1) loam, dark gray (5Y 4/1) dry; weak very fine granular structure; friable; slightly effervescent; slightly alkaline; clear smooth boundary.

Cg—20 to 60 inches; gray (5Y 5/1) silt loam; massive; friable; common medium and coarse prominent brownish yellow (10YR 6/6) and light olive brown (2.5Y 5/6) Fe concentrations; strongly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: At or near the surface
Thickness of the histic epipedon: 8 to 16 inches

Oa horizon:
Hue—5YR to 10YR or neutral
Value—2 or 3
Chroma—0 to 2
Texture—muck

A horizon:
Hue—10YR to 5Y or neutral
Value—2 or 3
Chroma—0 to 2
Texture—loam, sandy loam, fine sandy loam, sandy clay loam, or silt loam or the mucky analogs of these textures
Content of rock fragments—0 to 15 percent

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 7
Chroma—1 or 2
Texture—silt loam, loam, sandy clay loam, fine sandy loam, or sandy loam
Content of rock fragments—0 to 15 percent

187—Haug muck

Composition

Haug and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Swales and depressions on lake plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials over till
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Vallers and similar soils
- Arveson and similar soils
- Cathro and similar soils
- Soils that formed in outwash

Major Uses of the Unit

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Heimdal Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Moraines
Parent material: Till
Slope range: 2 to 30 percent
Taxonomic classification: Coarse-loamy, mixed Udic Haploborolls

Typical Pedon

Heimdal loam, in an area of Sisseton-Heimdal complex, 6 to 12 percent slopes, eroded, 1,050 feet east and 80 feet north of the southwest corner of sec. 17, T. 132 N., R. 42 W.

Ap—0 to 7 inches; black (10YR 2/1) loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; friable; common fine roots; about 3 percent gravel; neutral; abrupt smooth boundary.
Bw—7 to 17 inches; dark yellowish brown (10YR 3/4) loam; moderate medium subangular blocky structure; friable; common fine roots; about 5 percent gravel; neutral; clear smooth boundary.
Bk—17 to 34 inches; light olive brown (2.5Y 5/4) sandy loam; weak medium subangular blocky structure; friable; many very pale brown (10YR 7/3) carbonate coatings in pores; about 5 percent gravel; violently effervescent; moderately alkaline; clear smooth boundary.
C—34 to 60 inches; light olive brown (2.5Y 5/4) sandy loam; moderate medium platy soil fragments; friable; few distinct very pale brown (10YR 7/3) carbonate coatings in pores; about 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 12 to 26 inches
Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: 1 to 10 percent throughout

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—loam

Bw horizon:
Hue—10YR
Value—2 to 5
Chroma—2 to 4
Texture—loam, sandy loam, or fine sandy loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loam, sandy loam, or fine sandy loam

C horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—2 to 4
Texture—loam, fine sandy loam, or sandy loam

1324B—Heimdal-Sisseton complex, 2 to 6 percent slopes

Composition

Heimdal and similar soils: About 60 percent
Sisseton and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Heimdal

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.0 inches
Organic matter content: High

Sisseton

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Darnen and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Areas that have slopes of more than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Hillview Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderately rapid; lower part—moderate or moderately rapid
Landforms: Pitted outwash plains and moraines
Parent material: Glaciofluvial deposits
Slope range: 0 to 2 percent
Taxonomic classification: Coarse-loamy, mixed, frigid Mollic Endoaqualfs

Typical Pedon

Hillview fine sandy loam, 200 feet south and 1,075 feet west of the northeast corner of sec. 30, T. 137 N., R. 36 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) fine sandy loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; common very fine and fine roots; strongly acid; abrupt smooth boundary.

Eg—7 to 15 inches; grayish brown (2.5Y 5/2) sandy loam; weak medium and coarse subangular blocky structure; friable; common very fine and fine roots; few fine faint light olive brown (2.5Y 5/3) Fe concentrations; strongly acid; clear smooth boundary.

Btg1—15 to 22 inches; light brownish gray (2.5Y 6/2) loam; moderate medium and coarse subangular blocky structure; friable; few fine roots; many continuous faint grayish brown (2.5Y 5/2) clay films on faces of peds; few fine prominent dark brown (7.5YR 4/4) Fe concentrations; strongly acid; clear smooth boundary.

Btg2—22 to 29 inches; light brownish gray (2.5Y 6/2) loam; moderate medium and coarse subangular blocky structure; friable; few fine roots; few patchy faint light yellowish brown (2.5Y 6/3) clay films on faces of peds; few fine prominent dark brown (7.5YR 4/4) and common medium prominent brown (7.5YR 5/4) Fe concentrations; strongly acid; abrupt smooth boundary.

Cg—29 to 60 inches; stratified gray (10YR 6/1) fine sandy loam, light olive brown (2.5Y 5/3) silt loam, and light brownish gray (2.5Y 6/2) loamy very fine sand; massive breaking to thin platy fragments along depositional varves; very friable; few fine roots; many coarse and fine prominent yellowish brown (10YR 5/6) Fe concentrations; few red (2.5YR 4/6) cylindrical soft masses of iron; strongly acid.

Range in Characteristics

Depth to carbonates: 40 to more than 60 inches
Content of rock fragments: 0 to 5 percent throughout

A or Ap horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam

Eg horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—2
Texture—loamy fine sand, loamy sand, fine sandy loam, fine sand, or sandy loam

Btg horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—dominantly loam, sandy loam, fine sandy loam, or very fine sandy loam; subhorizons that have more sand or clay in some pedons

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 to 4
Texture—stratified very fine sandy loam, loamy very fine sand, and fine sand

1365—Hillview fine sandy loam

Composition

Hillview and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landforms: Flats on moraines and outwash plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciofluvial deposits
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Bluffcreek and similar soils
- Rosy and similar soils
- Epoufette and similar soils
- Forada and similar soils
- Borup and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Hubbard Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 12 percent

Taxonomic classification: Sandy, mixed Udorthentic Haploborolls

Typical Pedon

Hubbard loamy sand, 2 to 6 percent slopes, 1,525 feet south and 650 feet west of the northeast corner of sec. 31, T. 134 N., R. 39 W.

Ap—0 to 8 inches; black (10YR 2/1) loamy sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; many very fine and fine roots; moderately acid; abrupt smooth boundary.

A—8 to 12 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; very friable; many very fine and fine roots; moderately acid; abrupt smooth boundary.

Bw—12 to 17 inches; dark brown (10YR 3/3) loamy sand, brown (10YR 4/3) dry; weak fine subangular blocky structure; very friable; few very fine roots; moderately acid; about 1 percent gravel; moderately acid; clear smooth boundary.

BC—17 to 42 inches; dark yellowish brown (10YR 4/4) sand; single grain; few very fine roots; loose; about 1 percent gravel; slightly acid; clear smooth boundary.

C1—42 to 58 inches; dark yellowish brown (10YR 4/4) coarse sand; single grain; loose; about 5 percent gravel; slightly acid; clear smooth boundary.

C2—58 to 60 inches; yellowish brown (10YR 4/4) coarse sand; single grain; loose; about 10 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 40 to 60 inches
Thickness of the mollic epipedon: 10 to 26 inches
Content of rock fragments: 0 to 10 percent throughout

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy sand

Bw horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—2 to 4
Texture—coarse sand, loamy coarse sand, or loamy sand

C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2 to 5
Texture—coarse sand or sand

7A—Hubbard loamy sand, 0 to 2 percent slopes

Composition

Hubbard and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flats and slight rises on pitted outwash plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Duelm and similar soils
- Oylen and similar soils
- Verndale and similar soils
- Areas that have slopes of more than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

7B—Hubbard loamy sand, 2 to 6 percent slopes

Composition

Hubbard and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Duelm and similar soils
- Oylen and similar soils
- Verndale and similar soils
- Areas that have slopes of more than 6 percent
- Poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

7C—Hubbard loamy sand, 6 to 12 percent slopes

Composition

Hubbard and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.5 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Clontarf and similar soils
- Corliss and similar soils
- Areas that have slopes of more than 12 percent or less than 6 percent
- Poorly drained soils
- Very poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Isan Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderately rapid; lower part—rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 1 percent
Taxonomic classification: Sandy, mixed, frigid Typic Endoaquolls

Typical Pedon

Isan sandy loam, 1,075 feet north and 225 feet east of the southwest corner of sec. 16, T. 136 N., R. 39 W.

Ap—0 to 9 inches; black (10YR 2/1) sandy loam, dark gray (10YR 4/1) dry; weak very fine and fine subangular blocky structure; very friable; common very fine and fine roots; neutral; abrupt smooth boundary.

A—9 to 16 inches; very dark grayish brown (10YR 3/2) loamy sand, gray (10YR 5/1) dry; weak very fine and fine subangular blocky structure; very friable; few fine roots; clear smooth boundary.

Bg—16 to 26 inches; dark grayish brown (10YR 4/2) loamy sand; weak very fine and fine subangular blocky structure; very friable; few fine prominent olive brown (2.5Y 4/4) Fe concentrations and few fine faint dark gray (10YR 4/1) Fe depletions; neutral; clear smooth boundary.

Cg1—26 to 38 inches; grayish brown (2.5Y 5/2) sand; single grain; loose; few fine faint light olive brown (2.5Y 5/3) Fe concentrations; neutral; clear smooth boundary.

Cg2—38 to 52 inches; grayish brown (2.5Y 5/2) sand; single grain; loose; common faint medium light olive brown (2.5Y 5/3) Fe concentrations; about 3 percent gravel; neutral; abrupt smooth boundary.

Cg3—52 to 60 inches; light brownish gray (2.5Y 6/2) sand; single grain; loose; few fine prominent yellowish brown (10YR 5/6) Fe concentrations; neutral.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Thickness of the mollic epipedon: 10 to 24 inches
Content of rock fragments: 0 to 10 percent gravel

A or Ap horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—sandy loam

Bg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—4 or 5
Chroma—0 to 2
Texture—sand, coarse sand, loamy coarse sand, or loamy sand

C horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—sand or coarse sand

1110—Isan sandy loam

Composition

Isan and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on pitted outwash plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 4.5 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Leafriver and similar soils
- Nidaros and similar soils
- Duelm and similar soils
- Hubbard and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Kandota Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately rapid or moderate; lower part—moderate
Landform: Moraines
Parent material: Till

Slope range: 1 to 20 percent
Taxonomic classification: Fine-loamy, mixed Mollic Eutroboralfs

Typical Pedon

Kandota sandy loam, 2 to 6 percent slopes, 650 feet south and 100 feet west of the northeast corner of sec. 21, T. 135 N., R. 38 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) sandy loam, brown (10YR 5/3) dry; weak fine granular structure; friable; common very fine and fine roots; about 5 percent gravel; neutral; abrupt smooth boundary.

E—8 to 11 inches; brown (10YR 4/3) sandy loam, pale brown (10YR 6/3) dry; weak medium platy structure; very friable; common very fine and fine roots; about 2 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—11 to 22 inches; brown (10YR 4/3) sandy clay loam; moderate medium angular blocky structure; friable; few very fine roots; common discontinuous faint very dark grayish brown (10YR 3/2) and few discontinuous faint dark brown (10YR 3/3) clay films on faces of peds and in pores; few discontinuous distinct very pale brown (10YR 7/3) very fine sand coatings on faces of peds; about 3 percent gravel; slightly acid; gradual smooth boundary.

Bt2—22 to 32 inches; brown (10YR 4/3) sandy loam; moderate medium subangular blocky structure; friable; few patchy faint dark brown (10YR 3/3) clay films on faces of peds; very few discontinuous distinct very pale brown (10YR 7/3) very fine sand coatings on faces of peds; about 3 percent gravel; neutral; clear smooth boundary.

Bk—32 to 68 inches; light olive brown (2.5Y 5/4) sandy loam; weak medium subangular blocky structure; friable; common discontinuous fine and medium light gray (10YR 7/2) carbonate threads throughout; about 7 percent gravel; strongly effervescent; slightly alkaline; gradual wavy boundary.

C—68 to 80 inches; light olive brown (2.5Y 5/4) sandy loam; moderate medium and thin platy soil aggregates; massive; friable; about 7 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 24 to 50 inches
Content of rock fragments: 1 to 15 percent

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam

E horizon:
Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—sandy loam, fine sandy loam, or loamy sand

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 to 6
Texture—sandy clay loam, sandy loam, fine sandy loam, or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 or 4
Texture—sandy loam, fine sandy loam, or loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 to 6
Texture—sandy loam, fine sandy loam, or loam

53B—Kandota sandy loam, 2 to 6 percent slopes

Composition

Kandota and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this

section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Brandsvold and similar soils
- Bluffton and similar soils
- Knute and similar soils
- Soils that formed in outwash
- Areas that have stones on the surface
- Areas that have slopes of more than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

53C—Kandota sandy loam, 6 to 12 percent slopes

Composition

Kandota and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Brandsvold and similar soils
- Bluffton and similar soils
- Areas that have stones on the surface
- Soils that formed in outwash
- Areas that have slopes of more than 12 percent or less than 6 percent
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

53D—Kandota sandy loam, 12 to 20 percent slopes

Composition

Kandota and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Brandsvold and similar soils
- Bluffton and similar soils
- Areas that have stones on the surface
- Soils that formed in outwash
- Areas that have slopes of more than 20 percent or less than 12 percent

- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1275B—Kandota-Egglake, depressional, complex, 0 to 8 percent slopes

Composition

Kandota and similar soils: About 60 percent
Egglake and similar soils: About 25 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Kandota—summits and backslopes; Egglake—depressions
Slope range: Kandota—1 to 8 percent; Egglake—0 to 1 percent

Component Description

Kandota

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.8 inches
Organic matter content: Moderate

Egglake

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Till
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Cathro and similar soils
- Brandsvold and similar soils
- Knute and similar soils
- Areas that have slopes of more than 8 percent
- Areas that have stones on the surface
- Soils that are underlain by outwash

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1275C—Kandota-Egglake, depressional, complex, 0 to 15 percent slopes

Composition

Kandota and similar soils: About 55 percent
Egglake and similar soils: About 30 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Kandota—backslopes and shoulders; Egglake—depressions
Slope range: Kandota—8 to 15 percent; Egglake—0 to 1 percent

Component Description

Kandota

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.5 inches
Organic matter content: Moderate

Egglake

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Till
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 10.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Cathro and similar soils
- Brandsvold and similar soils
- Knute and similar soils
- Areas that have slopes of more than 15 percent
- Areas that have stones on the surface
- Soils that are underlain by outwash

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1347B—Kandota loam, 1 to 6 percent slopes

Composition

Kandota and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: 1 to 6 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Bluffton and similar soils
- Knute and similar soils
- Naytahwaush and similar soils
- Areas that have stones on the surface
- Areas that have slopes of more than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Kittson Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate; lower part—moderately slow or moderate
Landform: Lake plains
Parent material: Glaciolacustrine deposits over till
Slope range: 0 to 3 percent
Taxonomic classification: Fine-loamy, mixed Aquic Haploborolls

Typical Pedon

Kittson loam, 1,000 feet north and 800 feet west of the southeast corner of sec. 30, T. 131 N., R. 44 W.

Ap—0 to 7 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; friable; common fine and very fine roots; neutral; abrupt smooth boundary.

Bw—7 to 18 inches; olive brown (2.5Y 4/3) loam;

common fine and medium prominent dark yellowish brown (10YR 4/4) Fe concentrations; moderate medium subangular blocky structure; friable; common fine and very fine roots; neutral; gradual wavy boundary.

2Bk—18 to 32 inches; olive brown (2.5Y 5/3) clay loam; moderate medium subangular blocky structure; firm; few very fine roots; common fine and medium distinct light olive brown (2.5Y 5/6) Fe concentrations; common fine irregular light gray (10YR 7/2) carbonate concretions; about 2 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C—32 to 60 inches; grayish brown (2.5Y 5/2) clay loam; massive; firm; common fine and medium distinct light olive brown (2.5Y 5/6) Fe concentrations; about 3 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 14 to 30 inches
Thickness of the mollic epipedon: 7 to 16 inches
Depth to loamy glacial till: 14 to 30 inches

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam
Content of rock fragments—0 to 10 percent

Bw horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—2 or 3
Texture—loam, sandy loam, very fine sandy loam, sandy clay loam, or loamy sand
Content of rock fragments—0 to 35 percent

2Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loam, clay loam, or sandy loam
Content of rock fragments—2 to 10 percent

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loam or clay loam
Content of rock fragments—2 to 10 percent

58—Kittson loam

Composition

Kittson and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on lake plains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.4 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Mustinka and similar soils
- Hamerly and similar soils
- Soils that have more clay in the subsoil than the Kittson soil

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Knute Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate; lower part—moderately slow
Landform: Moraines
Parent material: Till

Slope range: 0 to 3
Taxonomic classification: Fine-loamy, mixed Aquic Argiborolls

Typical Pedon

Knute fine sandy loam, 1,200 feet south and 2,550 feet west of the northeast corner of sec. 9, T. 136 N., R. 43 W.

Ap—0 to 9 inches; black (10YR 2/1) fine sandy loam, very dark gray (10YR 3/1) dry; weak fine and medium subangular blocky structure; friable; many fine and very fine roots; about 4 percent gravel; neutral; abrupt smooth boundary.

Bt—9 to 22 inches; brown (10YR 4/3) sandy clay loam; weak medium prismatic structure grading to moderate fine and medium subangular blocky; firm; few fine and very fine roots; common discontinuous faint very dark grayish brown (10YR 3/2) clay films on faces of peds; about 4 percent gravel; neutral; abrupt wavy boundary.

Bk—22 to 29 inches; light olive brown (2.5Y 5/4) loam; weak fine and medium subangular blocky structure; friable; few fine and very fine roots; few fine distinct grayish brown (2.5Y 5/2) Fe depletions; many continuous prominent light gray (10YR 7/2) carbonate coatings on faces of peds; about 5 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

C—29 to 60 inches; light olive brown (2.5Y 5/6) loam; massive; friable; common fine and medium distinct grayish brown (2.5Y 5/2) Fe depletions; few fine light gray (10YR 7/2) carbonate threads; about 5 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 14 to 60 inches
Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: 2 to 10 percent throughout

A or Ap horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—fine sandy loam, sandy loam, or loam

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—sandy clay loam, fine sandy loam, loam, or sandy loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—fine sandy loam, loam, or sandy loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—fine sandy loam, loam, or sandy loam

670—Knute fine sandy loam

Composition

Knute and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Footslopes and toeslopes
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 9.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Chapett and similar soils
- Brandsvold and similar soils
- Weetown and similar soils
- Bluffton and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

- Forest Land section

1276—Knute-Brandsvold complex, thick solum

Composition

Knute and similar soils: About 60 percent
Brandsvold and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Knute—footslopes and toeslopes; Brandsvold—drainageways and flats
Slope range: Knute—0 to 3 percent; Brandsvold—0 to 2 percent

Component Description

Knute

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.3 inches
Organic matter content: Moderate

Brandsvold

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 9.3 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Kandota and similar soils
- Bluffton and similar soils
- Cathro and similar soils
- Soils that formed in outwash
- Areas that have stones on the surface

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1289—Knute fine sandy loam, thick solum

Composition

Knute and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Footslopes and toeslopes
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.6 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Kandota and similar soils
- Mahkonce and similar soils
- Brandsvold and similar soils
- Bluffton and similar soils
- Cathro and similar soils
- Areas that have stones on the surface

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1348—Knute loam, thick solum

Composition

Knute and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Footslopes and toeslopes
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 9.8 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Bluffton and similar soils
- Mahkonce and similar soils
- Kandota and similar soils
- Areas that have stones on the surface
- Areas that have slopes of more than 3 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Kratka Series

Depth class: Very deep
Drainage class: Poorly drained and very poorly drained
Permeability: Upper part—moderately rapid; next part—rapid; lower part—moderately slow or moderate
Landforms: Lake plains and moraines
Parent material: Glaciolacustrine deposits over till or glacial outwash over till
Slope range: 0 to 2 percent
Taxonomic classification: Sandy over loamy, mixed, frigid Typic Endoaquolls

Typical Pedon

Kratka fine sandy loam, 1,150 feet east and 1,200 feet north of the southwest corner of sec. 19, T. 131 N., R. 44 W.

Ap—0 to 9 inches; black (N 2/0) fine sandy loam, very dark gray (N 3/0) dry; weak fine and medium subangular blocky structure; very friable; common fine and medium roots; neutral; abrupt smooth boundary.

Bg1—9 to 17 inches; dark grayish brown (2.5Y 4/2) loamy fine sand; weak fine subangular blocky structure; very friable; common fine and very fine roots; common fine distinct light olive brown (2.5Y 5/6) Fe concentrations; neutral; clear wavy boundary.

Bg2—17 to 25 inches; grayish brown (2.5Y 5/2) fine sand; single grain; loose; few fine and very fine roots; common fine distinct light olive brown (2.5Y 5/6) Fe concentrations; neutral; abrupt wavy boundary.

2Bgk—25 to 40 inches; light brownish gray (2.5Y 6/2) clay loam; moderate fine and medium prismatic structure; firm; few very fine roots; common fine and medium prominent yellowish brown (10YR 5/6) Fe concentrations; common medium irregular light gray (10YR 7/2) carbonate threads; few fine irregular iron-manganese concretions; about 2 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

2Cg—40 to 60 inches; grayish brown (2.5Y 5/2) clay loam; massive; firm; common fine and medium distinct yellowish brown (10YR 5/6) Fe concentrations; about 2 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 20 to 40 inches
Thickness of the mollic epipedon: 8 to 18 inches

Depth to glacial till: 20 to 40 inches

A horizon:
Hue—2.5Y, 10YR, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—fine sandy loam
Content of rock fragments—0 to 5 percent

Bg horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—1 or 2
Texture—loamy fine sand, fine sand, loamy sand, or sand
Content of rock fragments—0 to 5 percent

2Bkg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 3
Texture—clay loam or loam
Content of rock fragments—0 to 5 percent

2Cg horizon:
Hue—10YR to 5Y
Value—4 to 6
Chroma—1 to 3
Texture—clay loam, loam, silt loam, or silty clay loam
Content of rock fragments—0 to 8 percent

481—Kratka fine sandy loam

Composition

Kratka and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landforms: Flats and rises on lake plains and moraines
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.0 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Wolverton and similar soils
- Foldahl and similar soils
- Soils that have carbonates above the subsoil
- Soils in which the till is at a greater depth than in the Kratka soil
- Well drained soils
- Very poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

726—Kratka sandy loam, thick solum, depressional

Composition

Kratka and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Glacial outwash over till
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 7.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is

available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Clitherall and similar soils
- Pinelake and similar soils
- Brandsvold and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Lakepark Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Colluvium over till
Slope range: 1 to 3 percent
Taxonomic classification: Fine-loamy, mixed, frigid Cumulic Endoaquolls

Typical Pedon

Lakepark loam, 2,100 feet south and 1,100 feet west of the northeast corner of sec. 1, T. 133 N., R. 44 W.

Ap—0 to 9 inches; black (N 2/0) loam, black (10YR 2/1) dry; weak fine subangular blocky structure; friable; common fine and medium roots; neutral; clear smooth boundary.

A1—9 to 22 inches; black (N 2/0) loam, black (10YR 2/1) dry; weak medium subangular blocky structure; friable; common fine roots; about 1 percent gravel; neutral; clear wavy boundary.

A2—22 to 35 inches; black (N 2/0) clay loam, black (10YR 2/1) dry; weak medium subangular blocky structure; friable; few fine roots; about 1 percent gravel; neutral; clear wavy boundary.

Bg—35 to 44 inches; grayish brown (2.5Y 5/2) clay loam; weak medium subangular blocky structure; firm; common medium prominent yellowish brown (10YR 5/6) Fe concentrations; few patchy distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine roots; about 2 percent gravel; neutral; clear wavy boundary.

Bkg—44 to 53 inches; light brownish gray (2.5Y 6/2) loam; weak medium subangular blocky structure; friable; common medium distinct light olive brown (2.5Y 5/6) Fe concentrations; many fine faint light gray (2.5Y 7/2) carbonate coatings on faces of peds; about 2 percent gravel; violently effervescent; moderately alkaline; gradual smooth boundary.

Cg—53 to 60 inches; light brownish gray (2.5Y 6/2) loam; massive; friable; many medium prominent yellowish brown (10YR 5/6) Fe concentrations; about 2 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 25 to 50 inches
Thickness of the mollic epipedon: 24 to 60 inches
Content of rock fragments: 1 to 8 percent throughout

A horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—loam

Bg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—clay loam, silty clay loam, or loam

Bkg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—loam or clay loam

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—loam or clay loam

1237—Lakepark loam

Composition

Lakepark and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Flats and swales on moraines
Slope range: 1 to 3 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Colluvium over till
Flooding: None

Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 11.2 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Darnen and similar soils
- Hamerly and similar soils
- Barnes and similar soils
- Parnell and similar soils
- Quam and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Lamoure Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderately slow or moderate
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Taxonomic classification: Fine-silty, mixed (calcareous), frigid Cumulic Endoaquolls

Typical Pedon

Lamoure silty clay loam, occasionally flooded, 550 feet south and 220 feet west of the northeast corner of sec. 11, T. 136 N., R. 47 W., in Wilkin County, Minnesota:

A1—0 to 18 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; slightly effervescent; moderately alkaline; gradual smooth boundary.

A2—18 to 32 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; slightly effervescent; moderately alkaline; clear smooth boundary.

Cg1—32 to 40 inches; grayish brown (2.5Y 5/2) silty clay loam; weak thin platy soil fragments; friable; few fine prominent olive (5Y 5/6) Fe concentrations; few medium very dark gray (2.5Y 3/1) stains; strongly effervescent; moderately alkaline; clear smooth boundary.

Cg2—40 to 48 inches; gray (5Y 4/2) silt loam; weak thin platy soil fragments; friable; few fine distinct olive brown (2.5Y 5/4) Fe concentrations; strongly effervescent; moderately alkaline; clear wavy boundary.

Cg3—48 to 60 inches; dark gray (2.5Y 4/1) and gray (2.5Y 5/1), stratified silt loam and very fine sand; massive; friable; few fine prominent yellowish brown (10YR 5/8) Fe concentrations; very dark gray (2.5Y 3/1) stains; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Thickness of the mollic epipedon: 24 to 60 inches
Content of rock fragments: Typically none throughout

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

Cg1 and Cg2 horizons:
Hue—2.5Y or 5Y
Value—3 to 5
Chroma—1 or 2
Texture—silty clay loam or silt loam

Cg3 horizon:
Hue—2.5Y or 5Y
Value—3 to 5
Chroma—1 or 2
Texture—stratified silt loam and very fine sand

418—Lamoure silty clay loam, occasionally flooded

Composition

Lamoure and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Flats on flood plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Frequency of flooding: Occasional

Seasonal high water table: At the surface to 1.5 feet below the surface
Available water capacity to 60 inches or root-limiting layer: About 11.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Arveson and similar soils
- Sedgeville and similar soils
- Areas that are frequently flooded
- Soils that are underlain by outwash
- Areas that are subject to only rare flooding

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Langhei Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate or moderately slow
Landform: Moraines
Parent material: Till
Slope range: 6 to 20 percent
Taxonomic classification: Fine-loamy, mixed, frigid Typic Eutrochrepts

Typical Pedon

Langhei loam, in an area of Barnes-Langhei complex, 6 to 12 percent slopes, eroded, 1,250 feet west and 2,500 feet south of the northeast corner of sec. 28, T. 134 N., R. 44 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; friable; few fine roots; about 5 percent gravel; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Bk1—7 to 13 inches; light yellowish brown (2.5Y 6/4) loam; weak medium subangular blocky structure; friable; few fine roots; many fine irregular light gray (10YR 7/2) carbonate threads; about 2 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—13 to 30 inches; light olive brown (2.5Y 5/4) loam; few patchy prominent yellowish brown (10YR 5/6) iron stains in root channels; weak medium subangular blocky structure; friable; many fine irregular light gray (10YR 7/2) carbonate threads; about 2 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

C—30 to 60 inches; light olive brown (2.5Y 5/4) loam; few patchy prominent yellowish brown (10YR 5/6) iron stains in root channels; massive; friable; about 2 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: At or near the surface
Content of rock fragments: 2 to 10 percent

Ap horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—1 or 2
Texture—loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—2.5Y
Value—4 to 7
Chroma—2 to 4
Texture—loam or clay loam

942D2—Langhei-Barnes complex, 12 to 20 percent slopes, eroded

Composition

Langhei and similar soils: About 55 percent
Barnes and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Langhei

Texture of the surface layer: Loam

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.4 inches
Organic matter content: Moderately low

Barnes

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lakepark and similar soils
- Cathro and similar soils
- Parnell and similar soils
- Roliss and similar soils
- Darnen and similar soils
- Hamerly and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Leaflake Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—rapid; lower part—moderate
Landform: Moraines
Parent material: Eolian deposits over till
Slope range: 1 to 20 percent
Taxonomic classification: Loamy, mixed Arenic Eutroboralfs

Typical Pedon

Leaflake loamy sand, in an area of Leaflake-Eagleview complex, 1 to 6 percent slopes, 2,600 feet south and 850 feet west of the northeast corner of sec. 31, T. 134 N., R. 38 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine and medium subangular blocky structure; very friable; many fine and very fine roots; slightly acid; abrupt smooth boundary.

E1—8 to 12 inches; dark grayish brown (10YR 4/2) sand, grayish brown (10YR 5/2) dry; single grain; loose; few very fine roots; common discontinuous distinct very dark gray (10YR 3/1) organic coatings on faces of peds; slightly acid; clear smooth boundary.

E2—12 to 26 inches; brown (10YR 5/3) sand, pale brown (10YR 6/3) dry; single grain; loose; few very fine roots; neutral; clear smooth boundary.

2Bt1—26 to 38 inches; dark yellowish brown (10YR 4/4) sandy clay loam; strong medium subangular blocky structure; friable; few continuous distinct very dark brown (10YR 2/2) and common continuous distinct dark brown (10YR 3/3) clay films on faces of peds and few patchy distinct dark brown (7.5YR 3/2) clay films on faces of peds and in pores; about 3 percent gravel; slightly acid; clear smooth boundary.

2Bt2—38 to 51 inches; yellowish brown (10YR 5/4) sandy clay loam; moderate medium subangular blocky structure; friable; common discontinuous distinct dark brown (10YR 3/3) and brown (10YR 4/3) clay films on faces of peds; about 3 percent gravel; slightly acid; clear smooth boundary.

2C1—51 to 62 inches; light yellowish brown (2.5Y 6/4) sandy loam; moderate medium and thin platy soil fragments; friable; very few patchy prominent light gray (10YR 7/2) carbonate coatings on horizontal faces of peds; about 3 percent gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

2C2—62 to 80 inches; light olive brown (2.5Y 5/4) sandy loam; massive parting to moderate thin platy soil fragments; friable; about 3 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 35 to 72 inches
Thickness of the sandy mantle: 20 to 40 inches
Content of rock fragments: Typically none in the upper part; 1 to 15 percent in the glacial till
Other features: The combined thickness of the 2Bt

horizons ranges from 7 to 32 inches.

Ap horizon:
Hue—10YR or 7.5YR
Value—2 to 4
Chroma—1 to 3
Texture—loamy sand

E horizon:
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—sand, fine sand, loamy sand, or loamy fine sand

2Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—sandy clay loam, fine sandy loam, sandy loam, or loam

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loam, sandy loam, or fine sandy loam

716B—Leaflake-Eagleview complex, 1 to 6 percent slopes

Composition

Leaflake and similar soils: About 55 percent
Eagleview and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: 1 to 6 percent

Component Description

Leaflake

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Eolian deposits over till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 7.2 inches
Organic matter content: Moderate

Eagleview

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.3 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Nitche and similar soils
- Kandota and similar soils
- Bluffton and similar soils
- Bemidji and similar soils
- Kratka and similar soils
- Areas that have slopes of more than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

716C—Leaflake-Eagleview complex, 6 to 12 percent slopes

Composition

Leaflake and similar soils: About 55 percent
Eagleview and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Leaflake

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Eolian deposits over till
Flooding: None

Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.6 inches
Organic matter content: Moderate

Eagleview

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.6 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Nitche and similar soils
- Kandota and similar soils
- Bluffton and similar soils
- Bemidji and similar soils
- Kratka and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

716D—Leaflake-Eagleview complex, 12 to 20 percent slopes

Composition

Leaflake and similar soils: About 55 percent
Eagleview and similar soils: About 30 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Leaflake

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Eolian deposits over till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 7.3 inches
Organic matter content: Moderate

Eagleview

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.5 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Nitche and similar soils
- Kandota and similar soils
- Bluffton and similar soils
- Bemidji and similar soils
- Kratka and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Leafriver Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Upper part—moderate or moderately

rapid; next part—moderately rapid or rapid; lower part—rapid
Landform: Pitted outwash plains
Parent material: Organic materials over outwash or lacustrine deposits
Slope range: 0 to 1 percent
Taxonomic classification: Sandy, mixed, frigid Histic Humaquepts

Typical Pedon

Leafriver muck, in an area of Forada and Leafriver soils, depressional, 1,300 feet west and 850 feet south of the northeast corner of sec. 11, T. 133 N., R. 40 W.

Oa—0 to 12 inches; muck (sapric material), black (N 2/0) broken face and rubbed; moderate medium subangular blocky structure; friable; many fine and medium roots; neutral; clear wavy boundary.
A—12 to 20 inches; black (10YR 2/1) loamy sand; weak fine granular structure; very friable; neutral; clear wavy boundary.
Cg—20 to 60 inches; dark gray (5Y 4/1) sand; massive; loose; neutral.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Thickness of the histic epipedon: 8 to 16 inches
Content of rock fragments: 0 to 15 percent in the mineral soil

Oa horizon:
Hue—10YR to 5YR or neutral
Value—2 or 3
Chroma—0 to 2
Texture—muck

A horizon:
Hue—10YR to 5Y or neutral
Value—2 or 3
Chroma—0 to 2
Texture—fine sand, loamy sand, or sandy loam or the mucky analogs of these textures

Cg horizon:
Hue—10YR to 5GY
Value—4 to 7
Chroma—1 or 2
Texture—loamy sand, fine sand, sand, or stratified with thin layers of loamy materials

Lida Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately rapid; lower part—rapid or very rapid
Landforms: Kame moraines and pitted outwash plains
Parent material: Glacial outwash
Slope range: 1 to 50 percent
Taxonomic classification: Coarse-loamy, mixed Mollic Eutroboralfs

Typical Pedon

Lida sandy loam (fig. 16), in an area of Lida-Two Inlets complex, 8 to 15 percent slopes, 1,450 feet west and 750 feet south of the northeast corner of sec. 5, T. 137 N., R. 40 W.

A1—0 to 2 inches; black (10YR 2/1) sandy loam, very dark brown (10YR 2/2) dry; weak fine and medium granular structure; very friable; many very fine and fine roots; about 3 percent gravel; neutral; clear smooth boundary.
A2—2 to 8 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; about 6 percent gravel; neutral; abrupt wavy boundary.
E—8 to 17 inches; grayish brown (10YR 5/2) loamy sand, light gray (10YR 7/2) dry; weak medium and coarse subangular blocky structure; friable; few very fine and fine roots; about 8 percent gravel; neutral; clear wavy boundary.
Bt1—17 to 25 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; moderate medium and coarse subangular blocky structure; firm; few very fine and fine roots; many continuous faint brown (10YR 4/3) clay films on faces of peds and in pores; about 16 percent gravel; neutral; clear wavy boundary.
Bt2—25 to 36 inches; dark yellowish brown (10YR 4/4) gravelly loamy sand; moderate fine and medium subangular blocky structure; friable; few very fine and fine roots; common discontinuous faint brown (10YR 4/3) clay bridging on sand and gravel; about 17 percent gravel; slightly acid; gradual wavy boundary.
Bt3—36 to 41 inches; brown (10YR 4/3) gravelly loamy sand; moderate fine and medium subangular blocky structure; friable; few very fine and fine roots; many continuous faint dark brown (10YR 3/3) clay bridging on sand and gravel; about 15 percent gravel; neutral; abrupt wavy boundary.
C—41 to 80 inches; brown (10YR 5/3) gravelly sand; single grain; loose; about 18 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 27 to 60 inches

Figure 16.—Typical profile of Lida sandy loam. This soil has an accumulation of clay in the subsoil and has sand and gravel in the substratum. Depth is marked in feet.

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam
Content of rock fragments—0 to 10 percent

E horizon:
Hue—10YR
Value—4 or 5
Chroma—2 to 4
Texture—sand, loamy sand, loamy coarse sand, loamy fine sand, or sandy loam
Content of rock fragments—0 to 10 percent

Bt horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—dominantly sandy loam, coarse sandy loam, or the gravelly analogs of these textures; subhorizons of loamy sand, sandy clay loam, loamy coarse sand, or loam or the gravelly or very gravelly analogs of these textures in some pedons
Content of rock fragments—10 to 35 percent

Bk horizon:
Hue—10YR, 2.5Y, or 7.5YR
Value—4 to 7
Chroma—2 to 6
Texture—dominantly loamy sand, loamy coarse sand, sand, or coarse sand or the gravelly analogs of these textures; very gravelly in subhorizons of some pedons
Content of rock fragments—10 to 35 percent

C horizon:
Hue—10YR, 2.5Y, or 7.5YR
Value—4 to 7
Chroma—2 to 6
Texture—dominantly sand, coarse sand, gravelly sand, or gravelly coarse sand; very gravelly in subhorizons of some pedons
Content of rock fragments—10 to 35 percent

1196B—Lida-Two Inlets complex, 1 to 8 percent slopes

Composition

Lida and similar soils: About 65 percent
Two Inlets and similar soils: About 20 percent
Inclusions: About 15 percent

Setting

Landforms: Kame moraines and pitted outwash plains
Position on the landform: Summits and backslopes
Slope range: 1 to 8 percent

Component Description

Lida

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.1 inches

Organic matter content: Moderate

Two Inlets

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bluffcreek and similar soils
- Almora and similar soils
- Pinelake and similar soils
- Areas that have stones on the surface
- Nidaros and similar soils
- Areas that have slopes of more than 8 percent or less than 1 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1196C—Lida-Two Inlets complex, 8 to 15 percent slopes

Composition

Lida and similar soils: About 60 percent
Two Inlets and similar soils: About 25 percent
Inclusions: About 15 percent

Setting

Landforms: Kame moraines and pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 8 to 15 percent

Component Description

Lida

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.9 inches
Organic matter content: Moderate

Two Inlets

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.6 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bluffcreek and similar soils
- Almora and similar soils
- Pinelake and similar soils
- Areas that have stones on the surface
- Nidaros and similar soils
- Areas that have slopes of more than 15 percent or less than 8 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1196E—Lida-Two Inlets complex, 15 to 30 percent slopes

Composition

Lida and similar soils: About 60 percent
Two Inlets and similar soils: About 25 percent
Inclusions: About 15 percent

Setting

Landforms: Kame moraines and pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 15 to 30 percent

Component Description

Lida

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches
Organic matter content: Moderate

Two Inlets

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.3 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Bluffcreek and similar soils
- Almora and similar soils
- Pinelake and similar soils
- Areas that have stones on the surface
- Nidaros and similar soils
- Areas that have slopes of more than 30 percent or less than 15 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1196F—Lida-Two Inlets complex, 30 to 50 percent slopes

Composition

Lida and similar soils: About 45 percent
Two Inlets and similar soils: About 40 percent
Inclusions: About 15 percent

Setting

Landforms: Kame moraines and pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 30 to 50 percent

Component Description

Lida

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches
Organic matter content: Moderate

Two Inlets

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.9 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Bluffcreek and similar soils
- Almora and similar soils

- Pinelake and similar soils
- Areas that have stones on the surface
- Nidaros and similar soils
- Areas that have slopes of less than 30 percent

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1343C—Lida-Almora-Lizzie complex, 8 to 15 percent slopes

Composition

Lida and similar soils: About 35 percent
Almora and similar soils: About 30 percent
Lizzie and similar soils: About 20 percent
Inclusions: About 15 percent

Setting

Landforms: Kame moraines and pitted outwash plains
Position on the landform: Lida—backslopes and shoulders; Almora—footslopes and toeslopes; Lizzie—backslopes and shoulders
Slope range: 8 to 15 percent

Component Description

Lida

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.7 inches
Organic matter content: Moderate

Almora

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.6 inches
Organic matter content: High

Lizzie

Texture of the surface layer: Very fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.5 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Two Inlets and similar soils
- Bluffcreek and similar soils
- Dent and similar soils
- Oakcreek and similar soils
- Pinelake and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1344B—Lida-Almora-Dent complex, 1 to 8 percent slopes

Composition

Lida and similar soils: About 35 percent
Almora and similar soils: About 30 percent
Dent and similar soils: About 20 percent
Inclusions: About 15 percent

Setting

Landforms: Kame moraines and pitted outwash plains
Position on the landform: Lida—summits and backslopes; Almora—footslopes and toeslopes; Dent—backslopes and footslopes

Slope range: Lida—1 to 8 percent; Almora—1 to 8 percent; Dent—1 to 6 percent

Component Description

Lida

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.7 inches
Organic matter content: Moderate

Almora

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 7.2 inches
Organic matter content: High

Dent

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.4 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Two Inlets and similar soils
- Bluffcreek and similar soils
- Lizzie and similar soils
- Oakcreek and similar soils
- Pinelake and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Lindaas Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderate; next part—slow; lower part—moderately slow
Landforms: Moraines, outwash plains, and lake terraces
Parent material: Glaciolacustrine deposits
Slope range: 0 to 2 percent
Taxonomic classification: Fine, montmorillonitic, frigid Typic Argiaquolls

Typical Pedon

Lindaas silty clay loam, morainic, 800 feet east and 1,000 feet north of the southwest corner of sec. 23, T. 135 N., R. 41 W.

Ap—0 to 8 inches; black (N 2/0) silty clay loam, dark gray (N 4/0) dry; moderate fine and medium subangular blocky structure; friable; common fine and medium roots; neutral; abrupt smooth boundary.

A—8 to 15 inches; black (N 2/0) silty clay loam, dark gray (N 4/0) dry; strong medium subangular blocky structure; friable; common fine and very fine roots; neutral; clear smooth boundary.

Bt—15 to 19 inches; very dark grayish brown (2.5Y 3/2) silty clay, dark gray (N 4/0) dry; moderate medium prismatic structure parting to strong fine and medium angular blocky; firm; common fine and very fine roots; common discontinuous distinct black (N 2/0) clay films on faces of peds; common fine distinct grayish brown (2.5Y 5/2) Fe depletions; neutral; clear wavy boundary.

Btg—19 to 25 inches; dark grayish brown (2.5Y 4/2) silty clay; moderate medium prismatic structure parting to strong fine and medium angular blocky; firm; common fine and very fine roots; common discontinuous faint very dark grayish brown (2.5Y 3/2) clay films on faces of peds; common fine distinct gray (5Y 5/1) and common fine prominent dark yellowish brown (10YR 4/6) Fe concentrations; common patchy distinct black (2.5Y 2/0) organic coatings on faces of peds; neutral; gradual irregular boundary.

Bkg—25 to 31 inches; grayish brown (2.5Y 5/2) silty clay loam; weak fine and medium subangular blocky structure; firm; few fine distinct light olive brown (2.5Y 5/6) Fe concentrations; few patchy distinct very dark gray (N 3/0) organic coatings in root channels and pores; common fine irregular carbonate threads and few fine rounded soft masses of carbonates; violently effervescent; moderately alkaline; gradual wavy boundary.

Cg1—31 to 55 inches; olive gray (5Y 5/2) silty clay loam; weak medium subangular blocky soil fragments; firm; many fine prominent dark yellowish brown (10YR 4/6) Fe concentrations; few fine irregular light gray (10YR 7/2) carbonate threads; strongly effervescent; slightly alkaline; clear smooth boundary.

Cg2—55 to 60 inches; light olive gray (5Y 6/2) silt loam; weak medium plate-like soil fragments; friable; many fine and medium prominent strong brown (7.5YR 4/6) Fe concentrations; common fine irregular soft masses of iron-manganese; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 18 to 35 inches
Thickness of the mollic epipedon: 16 to 30 inches

A horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam

Bt horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 5
Chroma—1 or 2
Texture—silty clay or clay

Bk horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 3
Texture—silt loam or silty clay loam

Cg horizon:
Hue—2.5Y or 5Y
Value—5 to 7
Chroma—1 to 4
Texture—silt loam, clay loam, or silty clay loam

1129—Lindaas silty clay loam, morainic

Composition

Lindaas and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landforms: Flats on outwash plains, lake terraces, and moraines
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Bygland and similar soils
- Dent and similar soils
- Naytahwaush and similar soils
- Parnell and similar soils
- Soils that are underlain by outwash
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Lizzie Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderate; lower part—moderate or moderately rapid
Landforms: Moraines, lake terraces, and ice-walled lake plains
Parent material: Glaciolacustrine deposits
Slope range: 2 to 20 percent

Taxonomic classification: Fine-silty, mixed Boralfic Udic Argiborolls

Typical Pedon

Lizzie silt loam, 6 to 12 percent slopes, eroded (fig. 17), 2,300 feet south and 80 feet east of the northwest corner of sec. 12, T. 136 N., R. 43 W.

Ap—0 to 10 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

Bt1—10 to 20 inches; brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; common fine roots; 50 percent or more dark grayish brown (10YR 4/2) sand coatings on faces of peds; few fine faint very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; slightly acid; gradual wavy boundary.

Bt2—20 to 35 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and medium angular blocky structure; friable; common fine roots; few dark grayish brown (10YR 4/2) sand coatings on faces of peds; common fine faint dark brown (10YR 3/3) clay films on faces of peds and in pores; slightly acid; abrupt wavy boundary.

Bk—35 to 40 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; common fine irregular light gray (10YR 7/2) carbonate threads; strongly effervescent; moderately alkaline; clear wavy boundary.

C—40 to 80 inches; yellowish brown (10YR 5/4) very fine sandy loam; massive; very friable; calcium carbonate disseminated throughout; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 15 to 40 inches
Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: 0 to 2 percent throughout

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—silt loam

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—silty clay loam, silt loam, loam, or clay loam

Figure 17.—Typical profile of Lizzie silt loam. The upper part of the subsoil has an accumulation of clay. Depth is marked in feet.

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 or 4
Texture—silt loam, loam, fine sandy loam, or very fine sandy loam

C horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 to 6
Texture—very fine sandy loam, silt loam, or loamy very fine sand with thin strata of fine sand below a depth of 40 inches

707B—Lizzie silt loam, 2 to 6 percent slopes

Composition

Lizzie and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landforms: Moraines, lake terraces, and ice-walled lake plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Hantho and similar soils
- Dent and similar soils
- Lindaas and similar soils
- Quam and similar soils
- Almora and similar soils
- Bygland and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

707C2—Lizzie silt loam, 6 to 12 percent slopes, eroded

Composition

Lizzie and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landforms: Moraines, lake terraces, and ice-walled lake plains
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.8 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Hantho and similar soils
- Dent and similar soils
- Lindaas and similar soils
- Quam and similar soils
- Almora and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

707D2—Lizzie silt loam, 12 to 20 percent slopes, eroded

Composition

Lizzie and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landforms: Moraines, lake terraces, and ice-walled lake plains
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.5 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hantho and similar soils
- Dent and similar soils
- Lindaas and similar soils
- Quam and similar soils
- Almora and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Mahkonce Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderately slow; next part—slow; lower part—moderately slow
Landform: Moraines
Parent material: Till
Slope range: 1 to 4 percent
Taxonomic classification: Fine, montmorillonitic Aquic Eutroboralfs

Typical Pedon

Mahkonce clay loam, 1 to 4 percent slopes (fig. 18), 2,300 feet west and 2,050 feet south of the northeast corner of sec. 2, T. 136 N., R. 42 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR 4/1) dry; moderate fine and medium subangular blocky structure; firm; many fine and medium roots; about 2 percent gravel; slightly acid; abrupt smooth boundary.

Bt—7 to 23 inches; olive brown (2.5Y 4/3) silty clay; moderate medium prismatic structure parting to strong fine and medium angular blocky; firm; common fine and medium roots; many discontinuous faint grayish brown (2.5Y 3/2) and common discontinuous distinct very dark brown (10YR 2/2) clay films on vertical and horizontal faces of peds; common fine and medium prominent yellowish brown (10YR 5/6) Fe concentrations and few fine faint dark grayish brown (2.5Y 4/2) Fe depletions; neutral; gradual wavy boundary.

Btk—23 to 33 inches; olive brown (2.5Y 4/3) clay loam; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few very fine and fine roots; common discontinuous faint very dark grayish brown (2.5Y 3/2) clay films on vertical faces of peds; common medium faint grayish brown (2.5Y 5/2) Fe depletions; few rounded light gray (10YR 7/2) soft masses of carbonates; slightly effervescent; slightly alkaline; gradual wavy boundary.

Bk—33 to 46 inches; grayish brown (2.5Y 5/2) clay loam; moderate medium and coarse subangular blocky structure; firm; many fine and medium prominent yellowish brown (10YR 5/6) Fe concentrations; common discontinuous distinct very dark grayish brown (10YR 3/2) organic coatings in pores and root channels; common fine and medium irregular light gray (10YR 7/2) carbonate threads; common fine rounded light gray (10YR 7/2) soft masses of carbonates; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—46 to 60 inches; light olive brown (2.5Y 5/4) clay loam; massive; firm; many fine and medium

Figure 18.—Typical profile of Mahkonce clay loam. The upper part of the subsoil has an accumulation of clay. Depth is marked in feet.

distinct grayish brown (2.5Y 5/2) and common coarse prominent yellowish brown (10YR 5/6) Fe concentrations; few fine rounded soft masses of iron-manganese; common fine rounded light gray (10YR 7/2) soft masses of carbonates; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 15 to 40 inches
Content of rock fragments: 1 to 8 percent throughout

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam

Bt horizon:
Hue—2.5Y or 10YR
Value—3 to 5
Chroma—2 to 4
Texture—clay loam, clay, silty clay, or silty clay loam

Bk horizon:
Hue—2.5Y or 10YR
Value—3 to 5
Chroma—2 to 4
Texture—loam, clay loam, or silty clay loam

C horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—2 to 4
Texture—loam, clay loam, or silty clay loam

1212B—Mahkonce clay loam, 1 to 4 percent slopes

Composition

Mahkonce and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Footslopes and toeslopes
Slope range: 1 to 4 percent

Component Description

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 9.8 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Cathro and similar soils
- Naytahwaush and similar soils
- Soils that are not underlain by till
- Areas that have stones on the surface
- Soils that are underlain by sandy loam till

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

McIntosh Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Upper part—moderate; lower part—moderately slow or moderate
Landform: Lake plains
Parent material: Glaciolacustrine deposits over till
Slope range: 0 to 3 percent
Taxonomic classification: Fine-silty, frigid Aeric Calciaquolls

Typical Pedon

McIntosh silt loam, 1,300 feet south and 800 feet east of the northwest corner of sec. 33, T. 136 N., R. 45 W., in Wilkin County, Minnesota:

Ap—0 to 7 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Ak—7 to 12 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; very friable; few fine rounded light gray (10YR 7/2) soft masses of carbonates; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk—12 to 25 inches; dark gray (10YR 4/1) silt loam; moderate medium subangular blocky structure; very friable; common medium rounded light gray (10YR 7/2) soft masses of carbonates; violently effervescent; moderately alkaline; clear smooth boundary.

2Cg1—25 to 29 inches; grayish brown (2.5Y 5/2) clay loam; massive; friable; few fine prominent brownish yellow (10YR 6/8) and common fine prominent yellowish brown (10YR 5/6) Fe concentrations; about 3 percent gravel; violently effervescent; slightly alkaline; gradual smooth boundary.

2Cg2—29 to 60 inches; grayish brown (2.5Y 5/2) clay loam; massive; friable; few fine prominent yellowish red (5YR 5/6) and common fine and medium prominent yellowish brown (10YR 5/6 and 5/8) Fe concentrations; about 2 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: At or near the surface
Thickness of the mollic epipedon: 7 to 16 inches
Depth to glacial till: 24 to 40 inches

Ap or Ak horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bk horizon:
Hue—10YR to 5Y
Value—4 to 6
Chroma—1 to 4
Texture—silt loam, silty clay loam, or loam

2Cg horizon:
Hue—2.5Y
Value—5 or 6
Chroma—3 to 6
Texture—clay loam or loam
Content of rock fragments—2 to 10 percent

108—McIntosh silt loam

Composition

McIntosh and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on lake plains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Winger and similar soils
- Hamerly and similar soils
- Soils in which carbonates have been leached to the subsoil
- Quam and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Meehan Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Upper part—moderately rapid; lower part—rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 3 percent
Taxonomic classification: Mixed, frigid Aquic Udipsamments

Typical Pedon

Meehan loamy sand, 200 feet east and 2,550 feet north of the southwest corner of sec. 31, T. 135 N., R. 38 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) loamy sand, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; very friable; common fine and medium roots; about 1 percent gravel; strongly acid; abrupt smooth boundary.

Bw1—8 to 18 inches; brown (10YR 4/3) sand; weak medium subangular blocky structure; very friable; few very fine and fine roots; common dark brown (10YR 3/3) coatings on faces of peds; about 1 percent gravel; slightly acid; clear smooth boundary.

Bw2—18 to 24 inches; brown (10YR 5/3) sand; single grain; loose; few very fine and fine roots; common medium faint dark grayish brown (10YR 4/2) and common medium distinct yellowish brown (10YR 5/6) Fe concentrations; about 2 percent gravel; slightly acid; clear smooth boundary.

C—24 to 55 inches; dark yellowish brown (10YR 4/4) coarse sand; single grain; loose; few medium roots; common medium distinct dark grayish brown (10YR 4/2) and many coarse distinct yellowish brown (10YR 5/8) Fe concentrations; few dark reddish brown (5YR 3/2) manganese coatings on internal planes; about 2 percent gravel; slightly acid; gradual smooth boundary.

Cg—55 to 60 inches; light brownish gray (10YR 6/2) coarse sand; single grain; loose; common medium faint dark grayish brown (10YR 4/2) and many medium prominent yellowish brown (10YR 5/8) Fe concentrations; about 4 percent gravel; neutral.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Content of rock fragments: 0 to 15 percent throughout

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy sand

Bw horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 8
Texture—sand, coarse sand, loamy sand, or loamy coarse sand

C or Cg horizon:
Hue—7.5YR or 10YR
Value—4 to 7
Chroma—2 to 4
Texture—sand or coarse sand

202—Meehan loamy sand

Composition

Meehan and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on pitted outwash plains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 1.0 to 2.5 feet
Available water capacity to 60 inches or root-limiting layer: About 3.9 inches

Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hubbard and similar soils
- Clearriver and similar soils
- Leafriver and similar soils
- Roscommon and similar soils
- Bluffcreek and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Mehurin Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderately slow; next part—slow or moderately slow; lower part—moderately slow or moderate
Landform: Moraines
Parent material: Till
Slope range: 1 to 4 percent
Taxonomic classification: Fine, montmorillonitic Aquertic Argiborolls

Typical Pedon

Mehurin clay loam, 1 to 4 percent slopes, 1,300 feet east and 225 feet north of the southwest corner of sec. 18, T. 131 N., R. 41 W.

Ap—0 to 9 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure parting to weak fine granular; friable; common fine roots; about 2 percent gravel; slightly acid; abrupt smooth boundary.

A—9 to 13 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; friable; common fine roots; about 2 percent gravel; slightly acid; gradual wavy boundary.

Bt1—13 to 21 inches; dark grayish brown (2.5Y 4/2) clay; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common fine roots; many continuous distinct very dark gray (10YR 3/1) clay films on faces of peds; about 2 percent gravel; slightly acid; gradual wavy boundary.

Bt2—21 to 26 inches; grayish brown (2.5Y 5/2) clay loam; strong medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many discontinuous faint dark grayish brown (2.5Y 4/2) clay films on faces of peds; common medium distinct light olive brown (2.5Y 5/6) Fe concentrations; about 2 percent gravel; clear smooth boundary.

Bk—26 to 34 inches; light olive brown (2.5Y 5/4) clay loam; moderate fine subangular blocky structure; firm; common medium distinct grayish brown (2.5Y 5/2) Fe depletions; many fine irregular light gray (10YR 7/2) soft masses of carbonates; about 3 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—34 to 60 inches; grayish brown (2.5Y 5/2) clay loam; massive; firm; many medium distinct light olive brown (2.5Y 5/6) Fe concentrations; few fine irregular light gray (10YR 7/2) soft masses of carbonates; about 3 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 14 to 36 inches
Thickness of the mollic epipedon: 8 to 16 inches
Content of rock fragments: 1 to 4 percent throughout

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—clay loam

Bt horizon:
Hue—2.5Y or 10YR
Value—3 to 5
Chroma—2 to 4
Texture—clay, silty clay, or clay loam

Bk horizon:
Hue—2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—clay loam or loam

C horizon:
Hue—2.5Y
Value—4 to 6
Chroma—2 to 4

Texture—clay loam or loam

769B—Mehurin clay loam, 1 to 4 percent slopes

Composition

Mehurin and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and rises on moraines
Slope range: 1 to 4 percent

Component Description

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Cathro and similar soils
- Peever and similar soils
- Soils that have carbonates in the surface soil
- Areas that have slopes of more than 4 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Mustinka Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderately slow; next part—slow; lower part—moderately slow
Landform: Lake plains
Parent material: Glaciolacustrine deposits over till
Slope range: 0 to 1 percent
Taxonomic classification: Fine, montmorillonitic, frigid Typic Argiaquolls

Typical Pedon

Mustinka silty clay loam, 300 feet west and 100 feet north of the southeast corner of sec. 2, T. 134 N., R. 47 W., in Wilkin County, Minnesota:

Ap—0 to 9 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; weak fine and medium subangular blocky structure; firm; many fine roots; neutral; abrupt smooth boundary.

A—9 to 14 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; weak fine and medium subangular blocky structure; firm; many fine roots; neutral; gradual wavy boundary.

Btg1—14 to 18 inches; dark olive gray (5Y 3/2) silty clay; moderate medium prismatic structure parting to moderate fine and medium angular blocky; firm; common fine roots; common discontinuous prominent black (N 2/0) clay films on faces of peds; neutral; clear wavy boundary.

Btg2—18 to 24 inches; olive gray (5Y 5/2) silty clay; moderate medium prismatic structure parting to moderate fine and medium angular blocky; firm; common fine prominent dark yellowish brown (10YR 4/6) Fe concentrations; common fine roots; common discontinuous faint dark olive gray (5Y 3/2) clay films on faces of peds; neutral; gradual wavy boundary.

Bkg—24 to 36 inches; brownish gray (2.5Y 5/2) silty clay loam; moderate medium prismatic structure parting to moderate fine and medium angular blocky; firm; common fine distinct gray (5Y 6/1) Fe depletions and common fine prominent dark yellowish brown (10YR 4/6) Fe concentrations; many fine soft masses of carbonate; common fine soft masses of iron-manganese; violently effervescent; moderately alkaline; gradual wavy boundary.

2Bkgy—36 to 52 inches; brownish gray (2.5Y 5/2) clay loam; moderate medium and coarse prismatic structure parting to weak fine and medium subangular blocky; firm; common fine distinct gray (5Y 6/1) Fe depletions and common fine prominent dark yellowish brown (10YR 4/6) Fe concentrations; many fine soft masses of carbonate; common fine nests of gypsum; common fine soft iron-manganese masses; about 3 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

2Cgy—52 to 80 inches; light olive brown (2.5Y 5/3) clay loam; massive with few vertical geogenetic fractures 1 to 3 feet apart; firm; common fine faint light brownish gray (2.5Y 6/2) Fe depletions and common fine prominent dark yellowish brown (10YR 4/6) Fe concentrations; common fine nests of gypsum; common fine soft iron-manganese masses; about 4 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 18 to 35 inches
Thickness of the mollic epipedon: 12 to 24 inches
Depth to glacial till: 20 to 50 inches
Content of rock fragments: Typically none in the upper part; 1 to 10 percent in the glacial till

A or Ap horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—silty clay loam

Btg horizon:
Hue—2.5Y, 5Y, or neutral
Value—3 to 5
Chroma—0 to 3
Texture—silty clay, clay, or silty clay loam

Bkg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—2 or 3
Texture—silty clay loam, silty clay, silt loam, or clay loam

2Bkg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 3
Texture—clay loam, silty clay loam, or loam

2Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 3
Texture—clay loam, silty clay loam, or loam

1214—Mustinka silty clay loam

Composition

Mustinka and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on lake plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Seasonal high water table: At the surface to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 10.2 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Aazdahl and similar soils
- Hamerly and similar soils
- Haug and similar soils
- Soils that have carbonates in the surface soil

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Naytahwaush Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately slow or moderate; next part—slow; lower part—moderately slow
Landform: Moraines
Parent material: Till
Slope range: 4 to 30 percent
Taxonomic classification: Fine, montmorillonitic Mollic Eutroboralfs

Typical Pedon

Naytahwaush clay loam, 8 to 15 percent slopes, eroded, 1,800 feet east and 300 feet north of the southwest corner of sec. 12, T. 131 N., R. 38 W.

Ap—0 to 7 inches; black (10YR 2/1) clay loam, dark

gray (10YR 4/1) dry; strong medium subangular blocky structure; friable; many fine roots; about 1 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—7 to 12 inches; brown (10YR 4/3) clay; strong medium angular blocky structure; firm; many fine and very fine roots; many distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; about 1 percent gravel; slightly acid; clear wavy boundary.

Bt2—12 to 24 inches; brown (10YR 4/3) clay; strong medium subangular blocky structure; firm; common fine and very fine roots; common discontinuous faint dark brown (10YR 3/3) clay films on faces of peds; about 1 percent gravel; slightly acid; clear smooth boundary.

Bk—24 to 34 inches; light olive brown (2.5Y 5/3) clay loam; moderate medium subangular blocky structure; friable; common fine and very fine roots; few fine prominent dark yellowish brown (10YR 4/6) Fe concentrations; common discontinuous prominent very dark brown (10YR 2/2) organic coatings in root channels and in pores; common fine irregular light gray (10YR 7/2) soft masses of carbonates; about 2 percent gravel; violently effervescent; slightly alkaline; gradual wavy boundary.

C—34 to 60 inches; light olive brown (2.5Y 5/3) clay loam; massive; friable; few very fine roots; many fine faint olive brown (2.5Y 4/4) and light olive brown (2.5Y 5/4) Fe concentrations; few fine irregular light gray (10YR 7/2) soft masses of carbonates; about 2 percent gravel; slightly effervescence; slightly alkaline.

Range in Characteristics

Depth to carbonates: 21 to 40 inches
Content of rock fragments: 1 to 8 percent throughout

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—clay loam

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—1 to 4
Texture—clay, silty clay, silty clay loam, or clay loam

Bk horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—3 to 5
Texture—clay loam, loam, or silty clay loam

C horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—3 to 5
Texture—clay loam, loam, or silty clay loam

718E—Naytahwaush loam, 15 to 30 percent slopes

Composition

Naytahwaush and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 15 to 30 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Mahkonce and similar soils
- Parnell and similar soils
- Cathro and similar soils
- Snellman and similar soils
- Areas that have slopes of more than 30 percent or less than 15 percent
- Soils that formed in outwash

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1208B—Naytahwaush-Mahkonce complex, 1 to 8 percent slopes

Composition

Naytahwaush and similar soils: About 45 percent
Mahkonce and similar soils: About 40 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Naytahwaush—footslopes and toeslopes; Mahkonce—summits and backslopes
Slope range: Naytahwaush—4 to 8 percent; Mahkonce—1 to 4 percent

Component Description

Naytahwaush

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.7 inches
Organic matter content: High

Mahkonce

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 9.8 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Cathro and similar soils
- Areas that have slopes of more than 8 percent
- Areas that have stones on the surface
- Soils that are underlain by sandy loam till

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1209C—Naytahwaush clay loam, 8 to 15 percent slopes, eroded

Composition

Naytahwaush and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 8 to 15 percent

Component Description

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.7 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Cathro and similar soils
- Mahkonce and similar soils
- Areas that have slopes of more than 15 percent or less than 8 percent
- Areas that have stones on the surface
- Soils that are underlain by sandy loam till

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Nidaros Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Upper part—moderately slow to moderately rapid; next part—moderate; lower part—rapid
Landforms: Pitted outwash plains and flood plains
Parent material: Organic materials over glacial outwash
Slope range: 0 to 1 percent
Taxonomic classification: Loamy, mixed, euic Terric Borosaprists

Typical Pedon

Nidaros muck, 275 feet east and 1,350 feet north of the southwest corner of sec. 15, T. 134 N., R. 38 W.

Oa1—0 to 20 inches; muck (sapric material), black (5YR 2/1) broken face, black (10YR 2/1) rubbed; about 6 percent fibers, 5 percent rubbed; strong medium granular structure; very friable; many fine and medium roots; fibers are primarily herbaceous; neutral; gradual smooth boundary.
Oa2—20 to 27 inches; muck (sapric material), black (N 2/0) broken face and rubbed; about 10 percent fibers, 2 percent rubbed; strong very thick platy structure; friable; fibers are primarily herbaceous; neutral; clear smooth boundary.
A1—27 to 33 inches; black (N 2/0) sandy clay loam; black (2.5Y 2/1) on faces of peds; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.
A2—33 to 38 inches; black (5Y 2/1) sandy loam; black (5Y 2/1) on faces of peds; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.
2Cg—38 to 80 inches; olive gray (5Y 5/2) coarse sand; single grain; loose; about 3 percent gravel; neutral.

Range in Characteristics

Depth to carbonates: 0 to more than 60 inches
Thickness of the histic epipedon: 16 to 50 inches

Oa horizon:
Hue—10YR, 7.5YR, 5YR, or neutral
Value—2 to 4
Chroma—0 to 3
Texture—muck

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—sandy clay loam, sandy loam, or loam or the mucky analogs of these textures

2Cg horizon:
Hue—2.5Y, 10YR, 7.5YR, 5Y, or neutral
Value—4 to 6
Chroma—0 to 4
Texture—coarse sand, sand, or loamy sand or the gravelly analogs of these textures
Content of rock fragments—0 to 35 percent gravel by volume

1111—Nidaros muck, frequently flooded

Composition

Nidaros and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on flood plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials over outwash
Frequency of flooding: Frequent
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 15.1 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Hubbard and similar soils
- Duelm and similar soils

- Bluffcreek and similar soils
- Roscommon and similar soils
- Pinelake and similar soils

Major Uses of the Unit

- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Forest Land section

1136—Nidaros muck

Composition

Nidaros and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on outwash plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials over outwash
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 13.9 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Hubbard and similar soils
- Dorset and similar soils
- Bluffcreek and similar soils
- Pinelake and similar soils
- Roscommon and similar soils
- Forada and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1346—Nidaros muck, calcareous

Composition

Nidaros and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on pitted outwash plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials over outwash
Flooding: None
Seasonal high water table: 1 foot above to 1 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 14.0 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Bluffcreek and similar soils
- Dorset and similar soils
- Arveson and similar soils
- Pinelake and similar soils
- Haslie and similar soils

Major Uses of the Unit

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Nitche Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately rapid or moderate; next part—rapid; lower part—moderate
Landform: Moraines
Parent material: Glacial outwash over till
Slope range: 1 to 12 percent
Taxonomic classification: Coarse-loamy, mixed Mollic Eutroboralfs

Typical Pedon

Nitche sandy loam, in an area of Nitche-Kandota-Lida complex, 1 to 6 percent slopes, 2,425 feet east and 1,650 feet south of the northwest corner of sec. 24, T. 135 N., R. 40 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) sandy loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure; friable; many very fine and fine roots; about 2 percent gravel; neutral; abrupt smooth boundary.

E—9 to 16 inches; dark brown (10YR 4/3) sandy loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; friable; common very fine and fine roots; about 2 percent gravel; slightly acid; clear smooth boundary.

Bt1—16 to 24 inches; dark brown (7.5YR 3/3) gravelly sandy loam; moderate medium subangular blocky structure; friable; many very fine and fine roots; about 30 percent gravel; common faint dark brown (7.5YR 3/2) clay films on faces of peds and in pores; few distinct (10YR 6/3) very fine sand and silt coatings on faces of peds; slightly acid; clear smooth boundary.

2Bt2—24 to 33 inches; brown (7.5YR 4/4) loamy sand; weak medium and coarse subangular blocky structure; very friable; few very fine and fine roots; about 10 percent gravel; common clay bridging between sand grains; neutral; clear smooth boundary.

2Bk1—33 to 55 inches; yellowish brown (10YR 5/4) gravelly sand; single grain; loose; common light gray (10YR 7/2) calcium carbonate coatings on the lower surfaces of pebbles; about 20 percent gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

3Bk2—55 to 62 inches; light olive brown (2.5Y 5/4) loam; weak coarse subangular blocky structure; firm; few light gray (10YR 7/2) threads and masses of calcium carbonate; about 5 percent gravel; slightly effervescent; moderately alkaline; clear smooth boundary.

3Bk3—62 to 70 inches; light olive brown (2.5Y 5/4) loam; moderate coarse subangular blocky structure; firm; many white (10YR 8/2) calcium carbonate coatings on vertical and horizontal faces of peds; few patchy yellowish red (5YR 4/6) and strong brown (7.5YR 5/6) iron stains on faces of peds; about 5 percent gravel; violently effervescent; moderately alkaline; gradual smooth boundary.

3C—70 to 80 inches; light yellowish brown (2.5Y 6/4) sandy loam; massive parting to moderate medium and thick platy soil aggregates; friable; about 5 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to 50 inches
Depth to glacial till: 40 to 60 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam, fine sandy loam, coarse sandy loam, or loam
Content of rock fragments—0 to 5 percent gravel

E horizon:
Hue—10YR
Value—4 to 6
Chroma—1 to 3
Texture—sandy loam, fine sandy loam, or loamy sand
Content of rock fragments—0 to 5 percent gravel

Bt horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—dominantly sandy loam, fine sandy loam, coarse sandy loam, or loam or the gravelly analogs of these textures; subhorizons of sandy clay loam in some pedons
Content of rock fragments—0 to 35 percent gravel

2Bt horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—loamy sand, loamy coarse sand, or the gravelly analogs of these textures
Content of rock fragments—0 to 35 percent gravel

2Bk horizon:
Hue—10YR, 2.5Y, or 7.5YR
Value—4 to 7
Chroma—2 to 6
Texture—loamy sand, loamy coarse sand, sand,

or coarse sand or the gravelly analogs of these textures
Content of rock fragments—averages 10 to 35 percent

3Bk horizon:
Hue—10YR, 2.5Y, or 7.5YR
Value—4 to 6
Chroma—3 or 4
Texture—sand, coarse sand, loamy coarse sand, or loamy sand or the gravelly analogs of these textures
Content of rock fragments—0 to 25 percent gravel

3C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 to 6
Texture—sandy loam or fine sandy loam
Content of rock fragments—2 to 15 percent gravel by volume

705B—Nitche-Kandota-Lida complex, 1 to 6 percent slopes

Composition

Nitche and similar soils: About 40 percent
Kandota and similar soils: About 30 percent
Lida and similar soils: About 20 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: 1 to 6 percent

Component Description

Nitche

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash over till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.9 inches
Organic matter content: High

Kandota

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.3 inches
Organic matter content: Moderate

Lida

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.9 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Pinelake and similar soils
- Dorset and similar soils
- Two Inlets and similar soils
- Kratka and similar soils
- Oylen and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

705C—Nitche-Kandota-Lida complex, 6 to 12 percent slopes

Composition

Nitche and similar soils: About 35 percent
Kandota and similar soils: About 30 percent
Lida and similar soils: About 20 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Nitche

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash over till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 7.8 inches
Organic matter content: High

Kandota

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.3 inches
Organic matter content: Moderate

Lida

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Pinelake and similar soils
- Dorset and similar soils
- Two Inlets and similar soils
- Kratka and similar soils
- Oylen and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Oakcreek Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate; next part—moderate or moderately rapid; lower part—rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 3 percent
Taxonomic classification: Fine-loamy, mixed Aquic Argiborolls

Typical Pedon

Oakcreek loam, 1,225 feet east and 875 feet south of the northwest corner of sec. 36, T. 131 N., R. 37 W.

Ap—0 to 10 inches; very dark brown (10YR 2/2) loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; friable; few and common very fine and fine roots; slightly acid; abrupt smooth boundary.

A—10 to 14 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; common very fine and fine roots; slightly acid; abrupt smooth boundary.

Bt1—14 to 23 inches; dark yellowish brown (10YR 4/4) loam; strong fine and medium subangular blocky structure; firm; common discontinuous distinct dark brown (10YR 3/3) clay films on faces of peds and in pores; common continuous distinct white (10YR 8/2) very fine sand and silt coatings on faces of peds; few fine and medium roots; slightly acid; clear smooth boundary.

Bt2—23 to 28 inches; dark yellowish brown (10YR 4/4) sandy clay loam; moderate medium and coarse subangular blocky structure; firm; many fine and medium prominent grayish brown (2.5Y 5/2) Fe depletions and common fine and medium distinct brown (7.5YR 4/4) and common fine prominent reddish brown (5YR 4/4) Fe concentrations; common discontinuous distinct dark brown (7.5YR 3/3) clay films on faces of peds and in pores; about 3 percent gravel; few fine and medium roots; neutral; clear smooth boundary.

Bt3—28 to 33 inches; dark brown (10YR 3/3) coarse sandy loam; moderate medium subangular blocky structure; friable; common medium and coarse

faint dark brown (7.5YR 4/3) Fe concentrations; common discontinuous faint very dark grayish brown (10YR 3/2) clay films and organic coatings on faces of peds; about 7 percent gravel; slightly effervescent; slightly alkaline; clear smooth boundary.

Btk1—33 to 38 inches; brown (10YR 4/3) gravelly coarse sandy loam; moderate medium subangular blocky structure; friable; common medium and coarse faint dark grayish brown (10YR 4/2) Fe depletions; common discontinuous faint very dark gray (10YR 3/1) and dark gray (10YR 4/1) clay films and organic coatings on faces of peds; common very pale brown (10YR 7/3) calcium carbonate masses and coatings on faces of peds; about 30 percent gravel; slightly effervescent; slightly alkaline; clear smooth boundary.

2Btk2—38 to 47 inches; brown (10YR 4/3) gravelly loamy coarse sand; weak coarse subangular blocky structure; very friable; common medium and coarse faint dark grayish brown (10YR 4/2) Fe depletions; common patchy faint very dark gray (10YR 3/1) clay bridging and organic coatings on and between sand grains; common very pale brown (10YR 7/3) calcium carbonate masses; about 30 percent gravel; slightly effervescent; slightly alkaline; clear smooth boundary.

2C—47 to 80 inches; light yellowish brown (2.5Y 6/3) gravelly coarse sand; single grain; loose; many coarse faint light brownish gray (2.5Y 6/2) Fe depletions; about 18 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 24 to more than 60 inches
Thickness of the mollic epipedon: 7 to 16 inches
Thickness of the loamy mantle: 24 to 40 inches
Content of rock fragments: 0 to 10 percent in the loamy mantle and 10 to 35 percent in the lower part of the profile

A or Ap horizon:
Hue—10YR or 7.5YR
Value—2 or 3
Chroma—1 to 3
Texture—loam

E horizon:
Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—loam, fine sandy loam, or sandy loam

Bt horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—3 to 6
Texture—dominantly loam, silt loam, or sandy clay loam; subhorizons of sandy loam, coarse sandy loam, or fine sandy loam or the gravelly analogs of these textures in some pedons

2Bt or 2Btk horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 or 4
Texture—sand, loamy coarse sand, or loamy sand or the gravelly analogs of these textures

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 7
Chroma—2 to 4
Texture—dominantly coarse sand, sand, or the gravelly analogs of these textures; subhorizons of fine sand, loamy coarse sand, loamy sand, or loamy fine sand or the gravelly analogs of these textures in some pedons

1338—Oakcreek loam

Composition

Oakcreek and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Flats and swales on pitted outwash plains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 7.5 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Dorset and similar soils
- Almora and similar soils
- Pinelake and similar soils
- Leafriver and similar soils

- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Oylen Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderately rapid or moderate; lower part—rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 3 percent
Taxonomic classification: Coarse-loamy, mixed Aquic Argiborolls

Typical Pedon

Oylen sandy loam, 1,025 feet north and 4,750 feet east of the southwest corner of sec. 4, T. 134 N., R. 41 W.

Ap—0 to 9 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; common very fine and fine roots; about 1 percent gravel; neutral; abrupt smooth boundary.

AB—9 to 13 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 4/3) dry; moderate medium subangular blocky structure; friable; few very fine and fine roots; few patchy faint very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; about 1 percent gravel; neutral; abrupt smooth boundary.

Bt1—13 to 18 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium and coarse subangular blocky structure; friable; many discontinuous faint brown (10YR 4/3) clay films on faces of peds and in pores; about 1 percent gravel; neutral; clear smooth boundary.

Bt2—18 to 22 inches; dark yellowish brown (10YR 4/4) coarse sandy loam; weak medium subangular blocky structure; friable; many discontinuous faint brown (10YR 4/3) clay films on faces of peds and in pores; about 13 percent gravel; neutral; clear wavy boundary.

2Bw—22 to 26 inches; yellowish brown (10YR 5/4) gravelly sand; single grain; loose; about 20 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

2Bk—26 to 35 inches; light yellowish brown (2.5Y 6/4) gravelly coarse sand; single grain; loose; few prominent patchy very pale brown (10YR 8/3) carbonate coatings on the lower surfaces of pebbles; about 34 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

2C—35 to 60 inches; very pale brown (10YR 7/3) gravelly coarse sand; single grain; loose; many coarse distinct light brownish gray (2.5Y 6/2) Fe depletions and common fine and medium distinct brownish yellow (10YR 6/8) Fe concentrations; about 20 percent gravel; slightly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 24 to 60 inches
Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: 0 to 5 percent in the upper sediments and 0 to 25 percent in the lower sediments
Thickness of the loamy mantle: 15 to 24 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam

Bt horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—3 to 6
Texture—sandy loam or loam

2Bw horizon:
Hue—10YR, 7.5YR, or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—loamy sand, loamy coarse sand, sand, or coarse sand or the gravelly analogs of these textures

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—sand, coarse sand, or very coarse sand or the gravelly analogs of these textures

1975—Oylen sandy loam

Composition

Oylen and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on pitted outwash plains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 5.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Dorset and similar soils
- Duelm and similar soils
- Clitherall and similar soils
- Pinelake and similar soils
- Nidaros and similar soils
- Very poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Paddock Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Upper part—moderate; next part—moderately slow; lower part—very slow
Landform: Drumlins
Parent material: Till
Slope range: 0 to 2 percent
Taxonomic classification: Coarse-loamy, mixed, frigid Udollic Epiaqualfs

Typical Pedon

Paddock fine sandy loam, in an area of Paddock-Becida complex, stony, 175 feet west and 2,125 feet south of the northeast corner of sec. 28, T. 137 N., R. 36 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; common fine and medium roots; about 2 percent gravel; moderately acid; abrupt smooth boundary.

E/B—8 to 15 inches; sandy loam, about 90 percent brown (10YR 5/3) (E) and 10 percent dark yellowish brown (10YR 4/4) (B); weak medium subangular blocky structure; friable; few very fine roots; common medium distinct grayish brown (2.5Y 5/2) Fe depletions and common prominent strong brown (7.5YR 5/6) Fe concentrations; about 2 percent gravel; moderately acid; clear smooth boundary.

Bt1—15 to 21 inches; grayish brown (2.5Y 5/2) sandy loam; moderate medium subangular blocky structure; firm; few very fine roots; common discontinuous distinct grayish brown (10YR 5/2) clay films on faces of peds and in pores; common medium prominent strong brown (7.5YR 5/8) and common prominent yellowish brown (10YR 5/8) Fe concentrations; about 2 percent gravel; moderately acid; clear smooth boundary.

Bt2—21 to 28 inches; brown (10YR 4/3) sandy loam; weak fine subangular blocky structure; friable; few very fine roots; few patchy faint grayish brown (10YR 5/2) clay films between sand grains; common medium distinct grayish brown (2.5Y 5/2) Fe depletions and common coarse prominent yellowish red (5YR 5/6) Fe concentrations; about 2 percent gravel; moderately acid; clear smooth boundary.

Bt3—28 to 36 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; firm; few very fine roots; few patchy prominent dark reddish brown (5YR 3/2) clay films in root channels and pores; common coarse prominent grayish brown (2.5Y 5/2) Fe depletions and common medium prominent strong brown (7.5YR 5/8) Fe concentrations; about 3 percent gravel; moderately acid; clear wavy boundary.

BC—36 to 40 inches; yellowish brown (10YR 5/4) sandy loam; weak medium subangular blocky structure; firm; few patchy prominent dark brown (7.5YR 3/2) clay films in root channels and pores;

about 3 percent gravel; slightly acid; clear wavy boundary.

Cd—40 to 60 inches; light olive brown (2.5Y 5/4) sandy loam; massive with moderate thin platy soil fragments; very firm; about 3 percent gravel; slightly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 40 to 55 inches
Depth to dense till: 40 to 60 inches
Content of rock fragments: 2 to 15 percent gravel; 0 to 3 percent cobbles

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam

E horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 or 2
Texture—sandy loam or fine sandy loam

EB, E/B, B/E, or BE horizon (if it occurs):
Colors—similar to those of the E and Bt horizons
Textures—similar to those of the E and Bt horizons

Bt horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—dominantly sandy loam; subhorizons of loam, fine sandy loam, or sandy clay loam in some pedons

Cd horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—3 to 6
Texture—dominantly sandy loam; subhorizons of loamy sand in some pedons

1321—Paddock-Becida complex, stony

Composition

Paddock and similar soils: About 55 percent
Becida and similar soils: About 30 percent
Inclusions: About 15 percent

Setting

Landform: Drumlins
Position on the landform: Paddock—footslopes and toeslopes; Becida—toeslopes
Slope range: 0 to 2 percent

Component Description

Paddock

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 1 to 2 feet
Available water capacity to 60 inches or root-limiting layer: About 6.1 inches
Organic matter content: High

Becida

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Seasonal high water table: At the surface to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 5.7 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Cathro and similar soils
- Runeberg and similar soils
- Rockwood and similar soils
- Blowers and similar soils
- Soils that have outwash over till

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Parnell Series

Depth class: Very deep
Drainage class: Poorly drained and very poorly drained
Permeability: Upper part—moderately slow or moderate; next part—slow; lower part—slow or moderately slow
Landform: Moraines
Parent material: Glaciolacustrine deposits over till
Slope range: 0 to 3 percent
Taxonomic classification: Fine, montmorillonitic, frigid Vertic Argiaquolls

Typical Pedon

Parnell silty clay loam, depressional, 2,200 feet west and 1,880 feet north of the southeast corner of sec. 25, T. 133 N., R. 42 W.

Ap—0 to 9 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.
A—9 to 18 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; moderate fine subangular blocky structure; firm; common fine roots; neutral; clear smooth boundary.
Btg1—18 to 32 inches; very dark gray (5Y 3/1) silty clay, dark gray (5Y 4/1) dry; weak medium prismatic structure parting to moderate fine subangular blocky; firm; common fine roots; few discontinuous prominent black (10YR 2/1) clay films on faces of peds; slightly acid; clear smooth boundary.
Btg2—32 to 42 inches; very dark gray (5Y 3/1) silty clay; weak medium prismatic structure parting to strong fine subangular blocky; firm; few fine roots; few discontinuous prominent black (10YR 2/1) clay films on faces of peds; few fine prominent light olive brown (2.5Y 5/4) Fe concentrations; neutral; gradual smooth boundary.
Btg3—42 to 50 inches; olive gray (5Y 4/2) silty clay; weak medium prismatic structure parting to strong fine subangular blocky; firm; few fine roots; few discontinuous prominent black (10YR 2/1) clay films on faces of peds; few fine prominent light olive brown (2.5Y 5/4) Fe concentrations; neutral; gradual wavy boundary.
Cg—50 to 60 inches; olive gray (5Y 5/2) silty clay loam; massive; firm; common medium distinct olive (5Y 5/4) Fe concentrations; about 1 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 35 to more than 60 inches
Thickness of the mollic epipedon: 24 to 60 inches
Content of rock fragments: 0 to 8 percent throughout

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—silty clay loam

Btg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—2 to 4
Chroma—1 or 2
Texture—silty clay, silty clay loam, clay loam, or clay

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 6
Chroma—1 or 2
Texture—silty clay loam, silty clay, clay loam, clay, or loam

34—Parnell silty clay loam, depressional

Composition

Parnell and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 10.2 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Aazdahl and similar soils

- Soils that have a silty surface layer
- Soils in which carbonates are closer to the surface than in the Parnell soil
- Poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

680—Parnell silt loam

Composition

Parnell and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Flats and swales on moraines
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 11.3 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Aazdahl and similar soils
- Hamerly and similar soils
- Gonvick and similar soils
- Roliss and similar soils
- Mehurin and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Peever Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately slow; lower part—slow or moderately slow
Landform: Moraines
Parent material: Till
Slope range: 3 to 18 percent
Taxonomic classification: Fine, montmorillonitic Udic Argiborolls

Typical Pedon

Peever clay loam, 6 to 12 percent slopes, 1,260 feet east and 2,150 feet south of the northwest corner of sec. 13, T. 131 N., R. 42 W.

Ap—0 to 9 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; many fine roots; about 1 percent gravel; neutral; abrupt smooth boundary.

Bt1—9 to 13 inches; very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) dry; strong medium subangular blocky structure; firm; many fine roots; many discontinuous distinct black (10YR 2/1) clay films on faces of peds; about 1 percent gravel; neutral; clear wavy boundary.

Bt2—13 to 18 inches; dark grayish brown (2.5Y 4/2) silty clay; weak medium prismatic structure parting to moderate medium subangular blocky; firm; many fine roots; common discontinuous distinct very dark gray (10YR 3/1) clay films on faces of peds; about 1 percent gravel; neutral; clear wavy boundary.

Bk1—18 to 24 inches; dark grayish brown (2.5Y 4/2) clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; many fine roots; common fine distinct gray (10YR 5/1) relict Fe depletions and common fine distinct brown (10YR 5/3) relict Fe concentrations; about 2 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—24 to 37 inches; olive brown (2.5Y 4/4) clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common medium prominent yellowish brown (10YR 5/6) and common fine distinct brown

(10YR 5/3) relict Fe concentrations and many fine prominent gray (10YR 5/1) relict Fe depletions; about 2 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

C—37 to 60 inches; light olive brown (2.5Y 5/4) clay loam; massive; firm; few fine prominent reddish brown (5YR 4/4) and common fine distinct yellowish brown (10YR 5/4) relict Fe concentrations and many fine prominent gray (10YR 5/1) relict Fe depletions; about 2 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 13 to 26 inches
Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: 1 to 6 percent throughout

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—clay loam

Bt horizon:
Hue—10YR or 2.5Y
Value—2 to 4
Chroma—1 to 3
Texture—clay, silty clay, or clay loam

Bk and C horizons:
Hue—2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—clay loam

646C—Peever clay loam, 6 to 12 percent slopes

Composition

Peever and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.4 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Mehurin and similar soils
- Parnell and similar soils
- Cathro and similar soils
- Soils that have carbonates above the subsoil
- Areas that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

646D—Peever clay loam, 12 to 18 percent slopes

Composition

Peever and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 12 to 18 percent

Component Description

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.5 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this

section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Mehurin and similar soils
- Parnell and similar soils
- Cathro and similar soils
- Soils that have carbonates above the subsoil
- Areas that have slopes of more than 18 percent or less than 12 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

779B—Peever-Mehurin complex, 2 to 6 percent slopes

Composition

Peever and similar soils: About 45 percent
Mehurin and similar soils: About 40 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Peever—summits and backslopes; Mehurin—footslopes and toeslopes
Slope range: Peever—3 to 6 percent; Mehurin—2 to 4 percent

Component Description

Peever

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.8 inches
Organic matter content: High

Mehurin

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 9.8 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Calcareous, poorly drained soils
- Cathro and similar soils
- Areas that have slopes of more than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Pinelake Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderately rapid in the upper part, rapid in the lower part; loamy substratum phase—moderately rapid in the upper part, rapid in the next part, moderate in the lower part
Landforms: Pitted outwash plains and moraines
Parent material: Glacial outwash and glacial outwash over till
Slope range: 0 to 2 percent
Taxonomic classification: Coarse-loamy, mixed, frigid Typic Argiaquolls

Typical Pedon

Pinelake sandy loam, 1,900 feet west and 300 feet north of the southeast corner of sec. 15, T. 134 N., R. 40 W.

Ap—0 to 12 inches; black (10YR 2/1) sandy loam, dark gray (10YR 4/1) dry; weak fine and medium

subangular blocky structure; friable; few fine and medium roots throughout; 2 percent gravel; neutral; abrupt smooth boundary.

Btg1—12 to 15 inches; grayish brown (2.5Y 5/2) coarse sandy loam; weak fine and medium subangular blocky structure; friable; common fine prominent strong brown (7.5YR 4/6) Fe concentrations; few very fine and fine roots throughout; few distinct olive gray (5Y 4/2) clay films on faces of peds; 2 percent gravel; neutral; clear smooth boundary.

Btg2—15 to 30 inches; dark grayish brown (2.5Y 4/2) coarse sandy loam; moderate fine and medium subangular blocky structure; friable; common fine faint dark yellowish brown (2.5Y 6/2) Fe depletions and few fine prominent light olive brown (2.5Y 5/6) Fe concentrations; common distinct dark olive gray (5Y 3/2) discontinuous clay films on faces of peds; 2 percent gravel; neutral; clear wavy boundary.

2Btg3—30 to 35 inches; grayish brown (2.5Y 5/2) loamy coarse sand; weak medium subangular blocky structure; very friable; many medium prominent yellowish brown (10YR 5/6) Fe concentrations; common distinct olive gray (5Y 4/2) clay bridging between sand grains; 2 percent gravel; neutral; clear wavy boundary.

2Cg—35 to 80 inches; light brownish gray (2.5Y 6/2) coarse sand; single grain; loose; common medium and coarse brownish yellow (10YR 6/6) Fe concentrations; 6 percent gravel; very slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 24 to 50 inches
Thickness of the mollic epipedon: 7 to 20 inches
Thickness of the loamy mantle: 20 to 40 inches

A or Ap horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—sandy loam
Content of rock fragments—0 to 15 percent

Btg horizon:
Hue—10YR, 5Y, or 2.5Y
Value—3 to 5
Chroma—1 to 3
Texture—coarse sandy loam, sandy loam, or loam
Content of rock fragments—0 to 35 percent

2Btg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 or 5
Chroma—1 to 3
Texture—loamy sand, loamy coarse sand, or sand or the gravelly analogs of these textures
Content of rock fragments—0 to 35 percent

2Cg horizon:
Hue—2.5Y or 5Y
Value—5 to 7
Chroma—1 or 2
Texture—loamy sand, loamy coarse sand, sand, or coarse sand or the gravelly analogs of these textures
Content of rock fragments—0 to 35 percent

3Cg horizon (if it occurs):
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—dominantly sandy loam, fine sandy loam, or loam; subhorizons of clay loam or sandy clay loam in some pedons
Content of rock fragments—3 to 15 percent

1215—Pinelake sandy loam

Composition

Pinelake and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on pitted outwash plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 5.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Oylen and similar soils
- Leafriver and similar soils
- Nidaros and similar soils

- Dorset and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1342—Pinelake, loamy substratum-Brandsvold complex

Composition

Pinelake and similar soils: About 60 percent
Brandsvold and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on moraines
Slope range: 0 to 2 percent

Component Description

Pinelake

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glacial outwash over till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 6.2 inches
Organic matter content: High

Brandsvold

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 9.6 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Kandota and similar soils
- Wykeham and similar soils
- Cathro and similar soils
- Kratka and similar soils
- Clitherall and similar soils
- Areas that have stones on the surface

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1030—Pits, gravel-Udipsamments complex

Composition

Pits: 50 percent
Udipsamments: 45 percent
Inclusions: About 5 percent

Component Description

Pits

Dominant parent material: Glacial outwash

Udipsamments

Texture of the surface layer: Sand
Depth class: Very deep (more than 60 inches)
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Very low

Inclusions

- Poorly drained soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

Quam Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Upper part—moderate; lower part—moderately slow
Landform: Moraines
Parent material: Glaciolacustrine deposits over till
Slope range: 0 to 1 percent
Taxonomic classification: Fine-silty, mixed, frigid Cumulic Endoaquolls

Typical Pedon

Quam silt loam, 2,300 feet north and 1,700 feet east of the southwest corner of sec. 23, T. 134 N., R. 44 W.

Ap—0 to 9 inches; black (N 2/0) silt loam, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; common fine roots; neutral; abrupt smooth boundary.

A1—9 to 27 inches; black (N 2/0) silt loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure parting to weak medium platy; friable; common fine roots; few fine prominent olive brown (2.5Y 4/4) Fe concentrations; neutral; clear smooth boundary.

A2—27 to 47 inches; black (N 2/0) silty clay loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; firm; few fine roots; few fine prominent olive brown (2.5Y 4/4) Fe concentrations; neutral; clear wavy boundary.

A3—47 to 56 inches; black (5Y 2.5/1) silty clay loam, dark gray (5Y 4/1) dry; weak medium subangular blocky structure; firm; neutral; clear wavy boundary.

2Cg1—56 to 60 inches; dark gray (5Y 4/1) loam; massive; friable; few fine prominent light olive brown (2.5Y 5/6) Fe concentrations; many discontinuous faint very dark gray (5Y 3/1) organic coatings on faces of peds; about 2 percent gravel; neutral; clear wavy boundary.

2Cg2—60 to 80 inches; gray (5Y 5/1) loam; many medium prominent yellowish brown (10YR 5/6) Fe concentrations; massive; friable; about 3 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 20 to 60 inches
Thickness of the mollic epipedon: 24 to 60 inches
Depth to glacial till: 24 to 60 inches

Ap horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silt loam

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silt loam, silty clay loam, silty clay, or loam

2Cg horizon:
Hue—2.5Y or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—loam, silt loam, silty clay loam, or clay loam
Content of rock fragments—2 to 8 percent

1227—Quam, Cathro, and Urness soils, ponded

Composition

Quam: Variable
Cathro: Variable
Urness: Variable
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines
Slope range: 0 to 1 percent

Component Description

Quam

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 12.5 inches
Organic matter content: Very high

Cathro

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials over glaciolacustrine deposits or till
Flooding: None

Seasonal high water table: 4.0 feet above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 16.7 inches
Organic matter content: Very high

Urness

Texture of the surface layer: Mucky silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Coprogenous earth
Flooding: None
Seasonal high water table: At the surface to 3 feet above the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 11.5 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Lakepark and similar soils
- Roliss and similar soils
- Vallers and similar soils
- Haslie and similar soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

1239—Quam silt loam

Composition

Quam and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Swales on moraines
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lakepark and similar soils
- Roliss and similar soils
- Cathro and similar soils
- Darnen and similar soils
- Hamerly and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Radium Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Rapid or very rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 3 percent
Taxonomic classification: Sandy, mixed Aquic Haploborolls

Typical Pedon

Radium loamy sand, 820 feet east and 500 feet north of the southwest corner of sec. 16, T. 131 N., R. 44 W.

Ap—0 to 11 inches; black (10YR 2/1) loamy sand, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; very friable; common fine and very fine roots; about 3 percent gravel; neutral; abrupt smooth boundary.
Bw—11 to 18 inches; brown (10YR 4/3) loamy sand;

weak very fine subangular blocky structure; very friable; common fine and very fine roots; about 5 percent gravel; neutral; clear smooth boundary.

Bk1—18 to 24 inches; yellowish brown (10YR 5/4) very gravelly coarse sand; single grain; loose; few very fine roots; many discontinuous distinct light gray (10YR 7/2) carbonate coatings on the underside of pebbles; many rounded light gray (10YR 7/2) soft masses of carbonates; about 40 percent gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—24 to 30 inches; grayish brown (2.5Y 5/2) gravelly coarse sand; single grain; loose; common fine and medium prominent yellowish brown (10YR 5/6) Fe concentrations; many discontinuous distinct light gray (10YR 7/2) carbonate coatings on the underside of pebbles; many fine rounded light gray (10YR 7/2) soft masses of carbonates; about 25 percent gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

C—30 to 60 inches; grayish brown (2.5Y 5/2) gravelly coarse sand; single grain; loose; common fine and medium prominent yellowish brown (10YR 5/6) Fe concentrations; common fine rounded light gray (10YR 7/2) soft masses of carbonates; about 20 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 10 to 30 inches
Thickness of the mollic epipedon: 10 to 20 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy sand
Content of rock fragments—0 to 5 percent

Bw horizon:
Hue—10YR
Value—2 to 4
Chroma—1 to 3
Texture—loamy sand, loamy fine sand, sand, gravelly loamy coarse sand, or gravelly sand
Content of rock fragments—5 to 35 percent

Bk horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—dominantly sand, loamy sand, coarse sand, or loamy coarse sand or the gravelly analogs of these textures; subhorizons of the very gravelly analogs of these textures in some pedons

C horizon:
Hue—10YR or 2.5Y
Value—4 to 7
Chroma—2 to 4
Texture—sand, loamy sand, coarse sand, or loamy coarse sand or the gravelly analogs of these textures
Content of rock fragments—5 to 35 percent

1874—Radium loamy sand

Composition

Radium and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on pitted outwash plains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Sandberg and similar soils
- Arvilla and similar soils
- Forada and similar soils
- Leafriver and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Rifle Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderate or moderately rapid
Landforms: Outwash plains and moraines
Parent material: Organic materials
Slope range: 0 to 1 percent
Taxonomic classification: Euic Typic Borohemists

Typical Pedon

Rifle mucky peat, 75 feet west and 50 feet south of the northeast corner of sec. 24, T. 135 N., R. 38 W.

Oe1—0 to 21 inches; mucky peat (hemic material), dark brown (7.5YR 3/2) broken face; about 75 percent herbaceous fibers, 70 percent rubbed; weak coarse subangular blocky structure; very friable; moderately acid; clear smooth boundary.
Oe2—21 to 80 inches; mucky peat (hemic material), very dark brown (10YR 2/2) broken face; about 90 percent herbaceous fibers, 35 percent rubbed; weak medium platy structure; moderately acid.

Range in Characteristics

Depth to carbonates: Greater than 60 inches
Thickness of the histic epipedon: Greater than 51 inches

Oe1 horizon:
Hue—10YR to 5YR
Value—2 or 3
Chroma—1 to 4
Texture—mucky peat

Oe2 horizon:
Hue—10YR, 7.5YR, or 5YR
Value—2 to 4
Chroma—2 to 4
Texture—dominantly mucky peat; muck or peat layers with a combined thickness of up to 10 inches are included in the range

541—Rifle mucky peat

Composition

Rifle and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landforms: Depressions on moraines and outwash plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Mucky peat
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials
Flooding: None
Seasonal high water table: 1 foot above to 1 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 31.8 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Epoufette and similar soils
- Egglake and similar soils
- Bluffton and similar soils
- Runeberg and similar soils
- Bluffcreek and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Rockwell Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderate or moderately rapid; next part—rapid; lower part—moderately slow or moderate
Landform: Lake plains
Parent material: Glaciolacustrine deposits over till
Slope range: 0 to 1 percent
Taxonomic classification: Coarse-loamy, frigid Typic Calciaquolls

Typical Pedon

Rockwell loam, 2,400 feet south and 2,200 feet west of the northeast corner of sec. 5, T. 132 N., R. 44 W.

Ap—0 to 10 inches; black (N 2/0) loam, very dark gray (N 3/0) dry; weak fine granular structure; friable; few very fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Ak—10 to 14 inches; black (5Y 2.5/1) fine sandy loam, gray (5Y 5/1) dry; weak fine granular structure; friable; few very fine roots; common fine irregular light gray (10YR 7/2) carbonate threads; violently effervescent; moderately alkaline; clear wavy boundary.

Bkg—14 to 27 inches; gray (5Y 5/1) fine sandy loam; weak fine subangular blocky structure; friable; few very fine roots; common fine irregular light gray (10YR 7/2) carbonate threads; violently effervescent; moderately alkaline; clear wavy boundary.

2Cg1—27 to 36 inches; dark grayish brown (2.5Y 4/2) loamy fine sand; massive; very friable; few fine distinct light olive brown (2.5Y 5/6) Fe concentrations; about 2 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

3Cg2—36 to 60 inches; grayish brown (2.5Y 5/2) loam; massive; friable; common medium prominent yellowish brown (10YR 5/6) Fe concentrations; common fine irregular light gray (10YR 7/2) carbonate threads; about 2 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Carbonates: At or near the surface
Thickness of the mollic epipedon: 7 to 18 inches
Depth to glacial till: 20 to 40 inches

A or Ak horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—loam

Bkg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—sandy loam, fine sandy loam, loam, sandy clay loam, or clay loam

2Cg horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—sand, fine sand, loamy sand, or loamy fine sand

3Cg horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—loam, silt loam, clay loam, or silty clay loam
Content of rock fragments—2 to 8 percent

63—Rockwell loam

Composition

Rockwell and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on lake plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Arveson and similar soils
- Hamerly and similar soils
- Soils in which carbonates have been leached
- Very poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Rockwood Series

Depth class: Very deep
Drainage class: Well drained

Permeability: Upper part—moderate; next part—moderately slow; lower part—very slow
Landform: Drumlins
Parent material: Till
Slope range: 2 to 20 percent
Taxonomic classification: Coarse-loamy, mixed Mollic Eutroboralfs

Typical Pedon

Rockwood sandy loam, 6 to 12 percent slopes, stony (fig. 19), 725 feet west and 750 feet north of the southeast corner of sec. 23, T. 137 N., R. 36 W.

A—0 to 9 inches; very dark gray (10YR 3/1) sandy loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; common fine and medium roots; about 5 percent gravel; strongly acid; abrupt smooth boundary.

E—9 to 16 inches; brown (10YR 5/3) loamy sand, light gray (10YR 7/2) dry; weak medium subangular blocky structure; very friable; few very fine roots; about 5 percent gravel; moderately acid; clear smooth boundary.

E/B—16 to 27 inches; about 15 percent brown (10YR 5/3) loamy sand (E), 85 percent dark brown (10YR 4/3) sandy loam (Bt); weak medium subangular blocky structure; friable; many continuous light brownish gray (10YR 6/2) sand coatings on faces of peds; few very fine roots; about 12 percent gravel; moderately acid; clear smooth boundary.

Bt—27 to 37 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; firm; few discontinuous faint brown (10YR 4/3) clay films on faces of peds; about 5 percent gravel; slightly acid; clear smooth boundary.

BC—37 to 41 inches; yellowish brown (10YR 5/4) sandy loam; moderate medium subangular blocky structure; firm; about 2 percent gravel; neutral; clear wavy boundary.

Cd—41 to 60 inches; light olive brown (2.5Y 5 /4) sandy loam; weak thick platy soil fragments; firm; about 2 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 40 to 60 inches
Depth to dense till: 40 to 60 inches
Content of rock fragments: 2 to 15 percent gravel; 0 to 3 percent cobbles

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam

Figure 19.—Typical profile of Rockwood sandy loam. The light colored subsurface layer indicates the removal of clay. The subsoil has an accumulation of clay, and the substratum is dense till. Depth is marked in feet.

E horizon:
Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—sandy loam or loamy sand

EB, E/B, B/E, or BE horizon (if it occurs):
Colors—similar to those of the E and Bt horizons
Textures—similar to those of the E and Bt horizons

Bt horizon:
Hue—10YR or 2.5Y

Value—4 or 5
Chroma—3 or 4
Texture—dominantly sandy loam; subhorizons of sandy clay loam in some pedons

Cd horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 or 4
Texture—dominantly sandy loam; subhorizons of loamy sand in some pedons

1319B—Rockwood sandy loam, 2 to 6 percent slopes, stony

Composition

Rockwood and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drumlins
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.2 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Becida and similar soils
- Runeberg and similar soils
- Paddock and similar soils
- Blowers and similar soils
- Areas that have slopes of more than 6 percent
- Soils that have outwash over till

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1319C—Rockwood sandy loam, 6 to 12 percent slopes, stony

Composition

Rockwood and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Drumlins
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.0 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Becida and similar soils
- Runeberg and similar soils
- Paddock and similar soils
- Blowers and similar soils
- Areas that have slopes of more than 12 percent or less than 6 percent
- Soils that have outwash over till

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1319D—Rockwood sandy loam, 12 to 20 percent slopes, stony

Composition

Rockwood and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Drumlins
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.5 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Becida and similar soils
- Runeberg and similar soils
- Paddock and similar soils
- Blowers and similar soils
- Areas that have slopes of more than 20 percent or less than 12 percent
- Soils that have outwash over till

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Roliss Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderately slow; lower part—moderately slow or moderate
Landforms: Lake plains and moraines
Parent material: Till
Slope range: 0 to 1 percent
Taxonomic classification: Fine-loamy, mixed (calcareous), frigid Typic Endoaquolls

Typical Pedon

Roliss clay loam, 600 feet west and 125 feet north of the southeast corner of sec. 19, T. 131 N., R. 43 W.

Ap—0 to 9 inches; black (N 2/0) clay loam, black (10YR 2/1) dry; moderate medium subangular blocky structure parting to weak fine granular; friable; few fine roots; about 2 percent gravel; slightly effervescent; slightly alkaline; abrupt smooth boundary.

A—9 to 14 inches; black (N 2/0) silty clay loam, dark gray (N 4/0) dry; moderate fine subangular blocky structure; friable; few fine roots; about 2 percent gravel; slightly effervescent; slightly alkaline; clear smooth boundary.

Bg—14 to 17 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; few fine distinct light olive brown (2.5Y 5/6) Fe concentrations; about 2 percent gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

2Cg1—17 to 27 inches; light brownish gray (2.5Y 6/2) loam; massive; friable; many medium distinct light olive brown (2.5Y 5/6) Fe concentrations; common fine irregular light gray (10YR 7/2) carbonate threads; about 3 percent gravel; strongly effervescent; slightly alkaline; gradual wavy boundary.

2Cg2—27 to 60 inches; light brownish gray (2.5Y 6/2) loam; massive; friable; many coarse prominent yellowish brown (10YR 5/6) Fe concentrations; common fine irregular light gray (10YR 7/2) carbonate threads; about 3 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Thickness of the mollic epipedon: 7 to 19 inches
Content of rock fragments: 0 to 15 percent throughout

A horizon:
Hue—10YR or neutral
Value—2 or 3
Chroma—0 or 1
Texture—clay loam or silty clay loam

Bg horizon:
Hue—2.5Y or 5Y
Value—3 to 5

Chroma—1 or 2
Texture—loam, sandy clay loam, clay loam, silty clay loam, silt loam, or fine sandy loam

2C horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 4
Texture—loam or clay loam

1240—Roliss clay loam

Composition

Roliss and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landforms: Flats and swales on lake plains and moraines
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 10.6 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Doran and similar soils
- Hamerly and similar soils
- Quam and similar soils
- Parnell and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Roscommon Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 2 percent
Taxonomic classification: Mixed, frigid Mollic Psammaquents

Typical Pedon

Roscommon loamy sand, 50 feet north and 300 feet east of the southwest corner of sec. 33, T. 135 N., R. 38 W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; common very fine and fine roots; about 2 percent gravel; moderately acid; clear smooth boundary.

Cg1—6 to 13 inches; dark grayish brown (10YR 4/2) sand; single grain; loose; few very fine roots; common medium prominent dark brown (7.5YR 4/4) Fe concentrations and common medium faint dark gray (10YR 4/1) Fe depletions; about 1 percent gravel; neutral; clear smooth boundary.

Cg2—13 to 23 inches; grayish brown (2.5Y 5/2) sand; single grain; loose; common medium prominent yellowish red (5YR 4/6) and strong brown (7.5YR 5/6) Fe concentrations; about 8 percent gravel; neutral; clear smooth boundary.

Cg3—23 to 46 inches; light brownish gray (2.5Y 6/2) sand; single grain; loose; few fine distinct light olive brown (2.5Y 5/4) Fe concentrations; about 1 percent gravel; neutral; clear smooth boundary.

Cg4—46 to 60 inches; light brownish gray (2.5Y 6/2) sand; single grain; loose; common medium prominent yellowish red (5YR 4/6) and common fine and medium prominent strong brown (7.5YR 5/6) Fe concentrations; few black (5YR 2/1) manganese concentrations; about 1 percent gravel; neutral.

Range in Characteristics

Depth to carbonates: 0 to 60 inches
Content of rock fragments: 0 to 10 percent gravel throughout

A or Ap horizon:
Hue—10YR or neutral
Value—2 or 3

Chroma—0 to 2
Texture—loamy sand

Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 to 3
Texture—dominantly sand, coarse sand, loamy sand, or loamy coarse sand; thin subhorizons of fine sand in some pedons

1943—Roscommon loamy sand

Composition

Roscommon and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and swales on pitted outwash plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glacial outwash
Flooding: None
Seasonal high water table: At the surface to 1 foot below the surface
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Leafriver and similar soils
- Nidaros and similar soils
- Duelm and similar soils
- Hubbard and similar soils
- Meehan and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Rosy Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landforms: Outwash plains and moraines
Parent material: Glaciofluvial deposits
Slope range: 0 to 3 percent
Taxonomic classification: Coarse-loamy, mixed Glossaquic Eutroboralfs

Typical Pedon

Rosy fine sandy loam, in an area of Bluffcreek-Rosy complex, 650 feet north and 150 feet east of the southwest corner of sec. 24, T. 134 N., R. 36 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; very friable; common fine and medium roots; slightly acid; abrupt smooth boundary.

E—9 to 11 inches; brown (10YR 5/3) sand, pale brown (10YR 6/3) dry; single grain; loose; common fine roots; slightly acid; clear smooth boundary.

E/B—11 to 26 inches; about 55 percent brown (10YR 4/3) loamy sand (E), 45 percent dark yellowish brown (10YR 4/4) sandy loam (Bt); weak medium subangular blocky structure; very friable; common fine and very fine roots; slightly acid; clear smooth boundary.

Bt1—26 to 34 inches; dark yellowish brown (10YR 4/4) fine sandy loam; moderate medium subangular blocky structure; friable; few fine and very fine roots; common discontinuous faint brown (10YR 4/3) and few patchy faint dark brown (10YR 3/3) clay films on faces of peds and in pores; common fine and medium distinct grayish brown (10YR 5/2) Fe depletions and few fine distinct strong brown (10YR 4/6) Fe concentrations; many discontinuous distinct light gray (10YR 7/2) fine sand coatings on faces of peds; neutral; clear smooth boundary.

Bt2—34 to 40 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; few very fine roots; common discontinuous faint brown (10YR 4/3) clay bridging and coatings on sand grains; common fine distinct grayish brown (10YR 5/2) Fe depletions; neutral; clear smooth boundary.

Bt3—40 to 48 inches; brown (10YR 4/3) loam; weak medium and coarse subangular blocky structure; friable; common patchy faint brown (10YR 3/3)

clay films on faces of peds and in pores; many medium and coarse distinct gray (10YR 5/1) Fe depletions and common fine and medium distinct very dark grayish brown (10YR 3/2) Fe concentrations; neutral; clear smooth boundary.

2C—48 to 60 inches; stratified light yellowish brown (2.5Y 6/3) silt loam and very fine sandy loam and pale yellow (5Y 7/3) sand; massive; friable; common medium prominent brownish yellow (10YR 6/6) Fe concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 29 to 60 inches
Content of rock fragments: 0 to 3 percent gravel

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam

E horizon:
Hue—10YR
Value—4 to 6
Chroma—1 or 2
Texture—loamy fine sand, loamy sand, loamy very fine sand, fine sandy loam, loam, sandy loam, or silt loam

EB, E/B, B/E, or BE horizon (if it occurs):
Colors—similar to those of the E and Bt horizons
Textures—similar to those of the E and Bt horizons

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—2 to 4
Texture—loam, fine sandy loam, very fine sandy loam, silt loam, or sandy loam

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 7
Chroma—2 to 4
Texture—stratified fine sand, sand, loamy sand, loamy fine sand, fine sandy loam, very fine sandy loam, sandy loam, loam, or silt loam

624—Rosy sandy loam

Composition

Rosy and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landforms: Flats on moraines and outwash plains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciofluvial deposits
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 9.1 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Hillview and similar soils
- Bluffcreek and similar soils
- Cathro and similar soils
- Very poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Rothsay Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderate; lower part—moderate or moderately rapid
Landform: Moraines
Parent material: Glaciolacustrine deposits
Slope range: 1 to 18 percent
Taxonomic classification: Coarse-silty, mixed Udic Haploborolls

Typical Pedon

Rothsay silt loam, 800 feet east and 4,800 feet north of the southwest corner of sec. 10, T. 133 N., R. 44 W.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; common fine roots; neutral; abrupt smooth boundary.

A—9 to 14 inches; very dark brown (10YR 2/2) silt loam, very dark grayish brown (10YR 3/2) dry; weak medium subangular blocky structure; friable; common fine roots; neutral; clear smooth boundary.

Bw—14 to 22 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium prismatic structure parting to moderate fine subangular blocky; friable; common fine roots; neutral; clear wavy boundary.

Bk—22 to 31 inches; brown (10YR 5/3) silt loam; weak medium subangular blocky structure; friable; few fine roots; common fine irregular light gray (10YR 7/2) carbonate threads; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—31 to 60 inches; yellowish brown (10YR 5/4) very fine sandy loam; weak thin platy soil fragments; very friable; few fine irregular light gray (10YR 7/2) carbonate threads; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 12 to 30 inches
Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: Typically none throughout

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

Bw horizon:
Hue—10YR
Value—3 to 5
Chroma—2 to 4
Texture—silt loam or very fine sandy loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—silt loam, loam, or very fine sandy loam

C horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—silt loam or very fine sandy loam

290—Rothsay silt loam

Composition

Rothsay and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and rises on moraines
Slope range: 1 to 3 percent

Component Description

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Zell and similar soils
- Hantho and similar soils
- Quam and similar soils
- Soils that have carbonates at or near the surface
- Areas that have slopes of more than 3 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

957B2—Rothsay-Zell complex, 2 to 6 percent slopes, eroded

Composition

Rothsay and similar soils: About 55 percent
Zell and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Rothsay

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.7 inches
Organic matter content: High

Zell

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.8 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hantho and similar soils
- Quam and similar soils
- Lakepark and similar soils
- Areas that have slopes of more than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Runeberg Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Upper part—moderate; next part—moderately slow; lower part—moderately slow or slow
Landform: Drumlins
Parent material: Till
Slope range: 0 to 1 percent
Taxonomic classification: Coarse-loamy, mixed, frigid Typic Endoaquolls

Typical Pedon

Runeberg mucky loam, depressional, 2,500 feet south and 2,380 feet west of the northeast corner of sec. 13, T. 137 N., R. 36 W.

A—0 to 10 inches; black (N 2/0) mucky loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bg1—10 to 14 inches; dark gray (10YR 4/1) loam; weak medium subangular blocky structure; friable; common fine roots; few fine prominent yellowish brown (10YR 5/6) Fe concentrations; about 1 percent gravel; neutral; clear smooth boundary.

Bg2—14 to 21 inches; grayish brown (2.5Y 5/2) sandy loam; weak medium subangular blocky structure; friable; few fine roots; common medium prominent brown (7.5YR 5/4) and strong brown (7.5YR 5/6) Fe concentrations; about 1 percent gravel; neutral; clear smooth boundary.

Bg3—21 to 36 inches; grayish brown (2.5Y 5/2) sandy loam; weak medium subangular blocky structure; friable; common coarse prominent strong brown (7.5YR 5/6) Fe concentrations; about 1 percent gravel; slightly alkaline; clear smooth boundary.

Cg1—36 to 48 inches; light brownish gray (2.5Y 6/2) sandy loam; massive; friable; few medium prominent strong brown (7.5YR 5/6) Fe concentrations; few light gray (10YR 7/2) carbonate concentrations; about 1 percent gravel; slightly effervescent; slightly alkaline; clear smooth boundary.

Cg2—48 to 60 inches; light olive gray (5Y 6/2) sandy loam; massive; firm; few fine prominent yellowish brown (10YR 5/6) Fe concentrations; few light gray (10YR 7/2) carbonate concentrations; about 2 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 24 to 36 inches
Thickness of the mollic epipedon: 8 to 20 inches
Content of rock fragments: 3 to 15 percent throughout

A horizon:
Hue—10YR to 5Y or neutral

Value—2 or 3
Chroma—0 to 2
Texture—mucky loam

Bg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 or 5
Chroma—1 or 2
Texture—sandy loam or loam

Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—sandy loam

701—Runeberg mucky loam, depressional

Composition

Runeberg and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions between drumlins
Slope range: 0 to 1 percent

Component Description

Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Till
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 8.3 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Rockwood and similar soils
- Blowers and similar soils
- Paddock and similar soils
- Becida and similar soils
- Cathro and similar soils
- Areas that have stones on the surface

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Rushlake Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Rapid
Landform: Lakeshores
Parent material: Beach deposits
Slope range: 0 to 3 percent
Taxonomic classification: Mixed, frigid Aquic Udipsamments

Typical Pedon

Rushlake sand, 2,950 feet west and 4,680 feet north of the southeast corner of sec. 20, T. 136 N., R. 40 W.

A—0 to 5 inches; very dark grayish brown (10YR 3/2) sand, grayish brown (10YR 5/2) dry; single grain; loose; many fine and very fine roots; about 11 percent gravel; neutral; abrupt smooth boundary.
C1—5 to 22 inches; brown (10YR 5/3) gravelly coarse sand; single grain; loose; few very fine roots; about 31 percent gravel; slightly effervescent; moderately alkaline; clear smooth boundary.
C2—22 to 30 inches; grayish brown (2.5Y 5/2) gravelly coarse sand; single grain; loose; about 18 percent gravel; slightly effervescent; strongly alkaline; clear smooth boundary.
C3—30 to 42 inches; dark grayish brown (2.5Y 4/2) gravelly coarse sand; single grain; loose; about 23 percent gravel; slightly effervescent; moderately alkaline; abrupt smooth boundary.
C4—42 to 60 inches; grayish brown (2.5Y 5/2) gravelly coarse sand; single grain; loose; about 25 percent gravel; slightly effervescent; strongly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 60 inches
Content of rock fragments: 0 to 35 percent throughout

A horizon:
Hue—10YR

Value—2 to 4
Chroma—1 to 3
Texture—sand or loamy sand

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—coarse sand, loamy coarse sand, sand, or loamy sand

1120—Rushlake-Hangaard complex

Composition

Rushlake and similar soils: About 55 percent
Hangaard and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Lakeshores
Slope range: Rushlake—0 to 3 percent; Hangaard—0 to 2 percent

Component Description

Rushlake

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Beach deposits
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 3.9 inches
Organic matter content: Moderate

Hangaard

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Beach deposits
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 2.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Corliss and similar soils
- Leafriver and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1307—Rushlake sand

Composition

Rushlake and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Lakeshores
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sand
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Beach deposits
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 3.6 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Corliss and similar soils
- Bluffcreek and similar soils
- Hangaard and similar soils
- Leafriver and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Sandberg Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Upper part—moderately rapid or rapid; lower part—rapid or very rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 20 percent
Taxonomic classification: Sandy, mixed Udorthentic Haploborolls

Typical Pedon

Sandberg loamy sand, 1 to 6 percent slopes (fig. 20), 1,380 feet north and 800 feet west of the southeast corner of sec. 33, T. 134 N., R. 43 W.

Ap—0 to 8 inches; black (10YR 2/1) loamy sand, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; common fine and medium roots; about 4 percent gravel; slightly acid; abrupt smooth boundary.

A—8 to 12 inches; very dark brown (10YR 2/2) gravelly loamy coarse sand, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; friable; common fine and medium roots; about 20 percent gravel; slightly acid; gradual wavy boundary.

Bw—12 to 19 inches; dark yellowish brown (10YR 3/4) gravelly loamy coarse sand; single grain; loose; about 17 percent gravel; neutral; clear wavy boundary.

Bk—19 to 29 inches; light olive brown (2.5Y 5/4) gravelly coarse sand; single grain; loose; common coarse distinct light gray (10YR 7/2) carbonate coatings on the underside of pebbles; about 25 percent gravel; slightly effervescent; slightly alkaline; diffuse wavy boundary.

C—29 to 80 inches; yellowish brown (10YR 5/4) gravelly coarse sand; single grain; loose; about 30 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 40 inches
Thickness of the mollic epipedon: 7 to 16 inches

Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—loamy sand
Content of rock fragments—0 to 15 percent by volume

Figure 20.—Typical profile of Sandberg loamy sand. This soil has a thin mantle of loamy material over sandy and gravelly outwash. Depth is marked in feet.

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—loamy sand, loamy coarse sand, sandy loam, coarse sandy loam, sand, or coarse sand or the gravelly analogs of these textures
Content of rock fragments—5 to 35 percent by volume

Bw horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—3 or 4
Texture—loamy sand, loamy coarse sand, coarse sand, or sand or the gravelly analogs of these textures
Content of rock fragments—5 to 35 percent by volume

Bk horizon:
Hue—10YR, 7.5YR, or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—coarse sand, sand, or the gravelly analogs of these textures
Content of rock fragments—5 to 35 percent by volume

C horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2 to 6
Texture—coarse sand, sand, or the gravelly analogs of these textures
Content of rock fragments—5 to 35 percent by volume

258A—Sandberg loamy sand, 0 to 2 percent slopes

Composition

Sandberg and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flats on outwash plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Hubbard and similar soils
- Dorset and similar soils
- Duelm and similar soils
- Isan and similar soils
- Areas that have slopes of more than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

258B—Sandberg loamy sand, 1 to 6 percent slopes

Composition

Sandberg and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Summits and backslopes
Slope range: 1 to 6 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Arvilla and similar soils
- Radium and similar soils
- Isan and similar soils
- Areas that have slopes of more than 6 percent or less than 1 percent
- Nidaros and similar soils
- Forada and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

258C—Sandberg loamy sand, 6 to 12 percent slopes

Composition

Sandberg and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Arvilla and similar soils
- Clontarf and similar soils
- Isan and similar soils
- Areas that have slopes of more than 12 percent or less than 6 percent
- Nidaros and similar soils
- Forada and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1219C—Sandberg-Sverdrup complex, 6 to 12 percent slopes

Composition

Sandberg and similar soils: About 55 percent
Sverdrup and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Sandberg

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.6 inches
Organic matter content: Moderate

Sverdrup

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Clontarf and similar soils
- Forada and similar soils
- Areas that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland

- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1223D—Sandberg-Arvilla complex, 12 to 20 percent slopes

Composition

Sandberg and similar soils: About 65 percent
Arvilla and similar soils: About 25 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Sandberg

Texture of the surface layer: Coarse sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.3 inches
Organic matter content: Moderate

Arvilla

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Oylen and similar soils
- Fordville and similar soils
- Clontarf and similar soils
- Forada and similar soils
- Leafriver and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Sedgeville Series

Depth class: Very deep
Drainage class: Poorly drained and very poorly drained
Permeability: Upper part—moderate or moderately rapid; next part—moderate; lower part—rapid or very rapid
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent slopes
Taxonomic classification: Coarse-loamy, mixed, frigid Fluvaquentic Endoaquolls

Typical Pedon

Sedgeville loam, frequently flooded, 1,300 feet east and 200 feet south of the northwest corner of sec. 3, T. 138 N., R. 38 W., in Becker County, Minnesota:

A—0 to 8 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; very friable; common fine and medium roots; about 1 percent gravel; neutral; clear wavy boundary.

Bg—8 to 17 inches; grayish brown (2.5Y 5/2) sandy loam; moderate medium subangular blocky structure; very friable; few fine and very fine roots; few fine prominent yellowish brown (10YR 5/6) Fe concentrations; about 5 percent gravel; neutral; clear wavy boundary.

Cg1—17 to 34 inches; grayish brown (2.5Y 5/2) coarse sandy loam; massive; very friable; few very fine roots; few fine prominent strong brown (7.5YR 5/6) Fe concentrations; about 10 percent gravel; strongly effervescent; slightly alkaline; gradual wavy boundary.

2Cg2—34 to 60 inches; grayish brown (2.5Y 5/2) gravelly loamy coarse sand with dark grayish brown (2.5Y 4/2) strata of silt loam and sandy loam; massive; about 30 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: At or near the surface
Thickness of the mollic epipedon: 7 to 16 inches
Thickness of loamy alluvium: 24 to 40 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 to 3
Texture—loam
Content of rock fragments—0 to 15 percent

Bg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—loam, silt loam, sandy loam, fine sandy loam, or coarse sandy loam
Content of rock fragments—0 to 15 percent

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—loam, silt loam, sandy loam, fine sandy loam, or coarse sandy loam or stratified with these textures
Content of rock fragments—0 to 15 percent

2Cg horizon:
Hue—2.5Y or 5Y
Value—5 or 6
Chroma—1 or 2
Texture—sand, coarse sand, loamy sand, or loamy coarse sand or the gravelly analogs of these textures
Content of rock fragments—0 to 35 percent

1291—Sedgeville loam, frequently flooded

Composition

Sedgeville and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Flats on flood plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Alluvium
Frequency of flooding: Frequent
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 8.4 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Nidaros and similar soils
- Forada and similar soils
- Soils that formed in sands
- Moderately well drained soils
- Areas that are not subject to flooding

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1293—Sedgeville fine sandy loam, rarely flooded

Composition

Sedgeville and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Flats on flood plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Frequency of flooding: Rare
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this

section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Nidaros and similar soils
- Forada and similar soils
- Soils that formed in sands
- Moderately well drained soils
- Areas that are frequently flooded

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1396—Sedgeville, Nidaros, and Aquolls soils, channeled

Composition

Sedgeville and similar soils: About 30 percent
Nidaros and similar soils: About 30 percent
Aquolls and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Sedgeville—meandering channels; Nidaros—depressions on flood plains; Aquolls—rises on flood plains and terraces
Slope range: Sedgeville—0 to 2 percent; Nidaros—0 to 1 percent; Aquolls—0 to 2 percent

Component Description

Sedgeville

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Alluvium
Frequency of flooding: Frequent
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 7.8 inches
Organic matter content: Very high

Nidaros

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 11.3 inches
Organic matter content: Very high

Aquolls

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Flooding: None
Seasonal high water table: 0.5 foot above to 1.5 feet below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 9.5 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section for the Sedgeville and Nidaros soils. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Wykeham and similar soils
- Kandota and similar soils
- Lida and similar soils
- Oylen and similar soils
- Duelm and similar soils
- Areas that have stones on the surface

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Seelyeville Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow to moderately rapid
Landforms: Lake plains and moraines
Parent material: Organic materials
Slope range: 0 to 10 percent
Taxonomic classification: Euic Typic Borosaprists

Typical Pedon

Seelyeville muck, 2,225 feet north and 2,075 feet west of the southeast corner of sec. 4, T. 137 N., R. 36 W.

Oa1—0 to 8 inches; muck (sapric material), black (7.5YR 2/0) broken face and black (10YR 2/1) rubbed; about 30 percent fibers, 2 percent rubbed; weak medium subangular blocky structure; friable; neutral; abrupt wavy boundary.

Oa2—8 to 70 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 10 percent fibers, 1 percent rubbed; weak medium subangular blocky structure; friable; few thin seams of hemic material less than 2 inches thick with a combined thickness of less than 10 inches; slightly acid; clear smooth boundary.

Oa3—70 to 80 inches; muck (sapric material), black (7.5YR 2/0) broken face and black (10YR 2/1) rubbed; about 10 percent fibers, 2 percent rubbed; weak medium subangular blocky structure; friable; slightly acid.

Range in Characteristics

Thickness of the histic epipedon: Greater than 51 inches
Depth to carbonates: Typically greater than 60 inches

Oa horizon:
Hue—10YR, 7.5YR, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—muck

540—Seelyeville muck

Composition

Seelyeville and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landforms: Depressions on lake plains, outwash plains, and moraines
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 24.0 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Epoufette and similar soils
- Egglake and similar soils
- Bluffton and similar soils
- Runeberg and similar soils
- Bluffcreek and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1825B—Seelyeville muck, seep land, 1 to 10 percent slopes

Composition

Seelyeville and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Seeps (sidehill seeps)
Slope range: 1 to 10 percent

Component Description

Texture of the surface layer: Muck
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic materials
Flooding: None
Seasonal high water table: At the surface to 2 feet below the surface
Available water capacity to 60 inches or root-limiting layer: About 24.0 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this

section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Kandota and similar soils
- Lida and similar soils
- Bluffton and similar soils
- Pinelake and similar soils
- Brandsvold and similar soils
- Areas that have slopes of more than 10 percent

Major Uses of the Unit

- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Sioux Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Upper part—moderately rapid; lower part—rapid or very rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 2 to 40 percent
Taxonomic classification: Sandy-skeletal, mixed Udorthentic Haploborolls

Typical Pedon

Sioux loamy sand, 2 to 12 percent slopes, 1,250 feet west and 1,425 feet north of the southeast corner of sec. 29, T. 132 N., R. 39 W.

Ap—0 to 10 inches; black (10YR 2/1) loamy sand, dark gray (10YR 4/1) dry; weak fine granular structure; friable; few fine roots; about 5 percent gravel; slightly effervescent; slightly alkaline; abrupt smooth boundary.

A—10 to 14 inches; very dark grayish brown (10YR 3/2) gravelly loamy sand, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; few fine and very fine roots; about 15 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

C—14 to 60 inches; light olive brown (2.5Y 5/3) very gravelly coarse sand; single grain; loose; about 50 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Thickness of the mollic epipedon: 7 to 14 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—loamy sand
Content of rock fragments—5 to 35 percent

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—stratified with gravelly sand, gravelly coarse sand, or the very gravelly or extremely gravelly analogs of these textures
Content of rock fragments—averages 35 to 60 percent

402C—Sioux loamy sand, 2 to 12 percent slopes

Composition

Sioux and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 2 to 12 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.3 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Arvilla and similar soils
- Sandberg and similar soils

- Radium and similar soils
- Soils in which carbonates have been leached to the subsoil
- Areas that have slopes of more than 12 percent
- Poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

402E—Sioux loamy sand, 12 to 40 percent slopes

Composition

Sioux and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 12 to 40 percent

Component Description

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.3 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Arvilla and similar soils
- Soils in which carbonates have been leached to the subsoil
- Radium and similar soils
- Areas that have slopes of more than 40 percent or less than 12 percent
- Sandberg and similar soils
- Nidaros and similar soils

Major Uses of the Unit

- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Sisseton Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Moraines
Parent material: Till
Slope range: 2 to 30 percent
Taxonomic classification: Coarse-loamy, mixed, frigid Typic Eutrochrepts

Typical Pedon

Sisseton loam, in an area of Sisseton-Heimdal complex, 6 to 12 percent slopes, eroded, 1,650 feet east and 1,900 feet north of the southwest corner of sec. 6, T. 135 N., R. 43 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loam, light grayish brown (10YR 6/2) dry; weak very fine granular structure; very friable; many fine roots; about 6 percent gravel; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bk—9 to 19 inches; light yellowish brown (10YR 6/4) loam; weak medium platy structure parting to weak fine subangular blocky; very friable; few fine roots; common discontinuous distinct white (10YR 8/2) carbonate coatings on faces of peds; about 5 percent gravel; violently effervescent; moderately alkaline; clear smooth boundary.

C—19 to 60 inches; pale brown (10YR 6/3) sandy loam; massive; very friable; few discontinuous distinct white (10YR 8/2) carbonate coatings on faces of peds; about 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 8 inches
Content of rock fragments: 1 to 10 percent throughout

A horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 4
Texture—loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—loam or silt loam

C horizon:
Hue—2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—sandy loam or loam

777C2—Sisseton-Heimdal complex, 6 to 12 percent slopes, eroded

Composition

Sisseton and similar soils: About 55 percent
Heimdal and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Sisseton

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

Heimdal

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.1 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Darnen and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Cathro and similar soils
- Areas that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

777D2—Sisseton-Heimdal complex, 12 to 20 percent slopes, eroded

Composition

Sisseton and similar soils: About 60 percent
Heimdal and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Sisseton

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

Heimdal

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Darnen and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Cathro and similar soils
- Areas that have slopes of more than 20 percent or less than 12 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

777E—Sisseton-Heimdal complex, 20 to 30 percent slopes

Composition

Sisseton and similar soils: About 70 percent
Heimdal and similar soils: About 20 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 20 to 30 percent

Component Description

Sisseton

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.1 inches
Organic matter content: Moderate

Heimdal

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Darnen and similar soils
- Lakepark and similar soils
- Quam and similar soils
- Cathro and similar soils
- Areas that have slopes of more than 30 percent or less than 20 percent

Major Uses of the Unit

- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Snellman Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderate or moderately rapid; lower part—moderate
Landform: Moraines
Parent material: Till
Slope range: 1 to 45 percent
Taxonomic classification: Fine-loamy, mixed Typic Eutroboralfs

Typical Pedon

Snellman sandy loam, 2 to 8 percent slopes (fig. 21), 1,300 feet east and 1,300 feet south of the northwest corner of sec. 4, T. 137 N., R. 38 W.

Ap—0 to 9 inches; brown (10YR 4/3) sandy loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many fine and medium roots; neutral; about 3 percent gravel; abrupt smooth boundary.

E—9 to 12 inches; brown (10YR 5/3) sandy loam, light gray (10YR 7/2) dry; weak thin platy structure; friable; common fine and medium roots; about 3 percent gravel; neutral; clear irregular boundary.

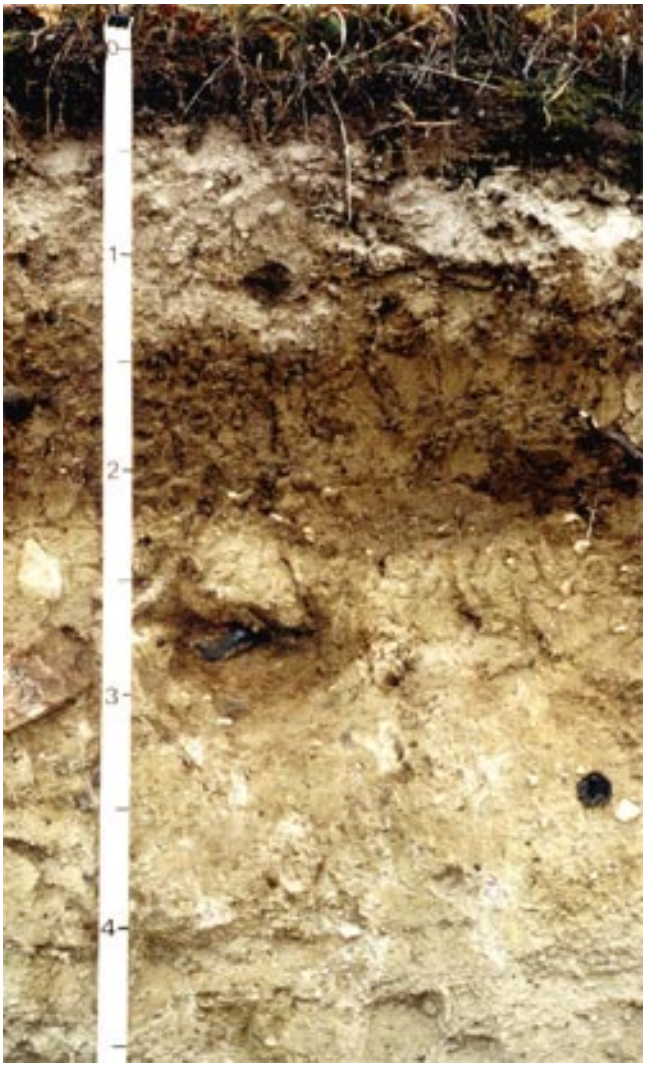


Figure 21.—Typical profile of Snellman sandy loam. The light colored subsurface layer indicates the removal of clay, and the subsoil has an accumulation of clay. Depth is marked in feet.

Bt1—12 to 15 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate fine subangular blocky structure; firm; many continuous faint brown (10YR 5/3) sand skeletans on vertical faces of peds; common fine and medium roots; about 3 percent gravel; slightly alkaline; clear irregular boundary.

Bt2—15 to 19 inches; dark yellowish brown (10YR 4/4) sandy clay loam; strong medium subangular blocky structure; firm; few fine and medium roots; common discontinuous faint brown (10YR 4/3) clay films and common patchy faint dark brown (10YR 3/3) clay films on faces of peds and in pores; few discontinuous faint brown (10YR 5/3) sand skeletans on vertical faces of peds; about 3 percent gravel; slightly alkaline; clear wavy boundary.

Bt3—19 to 31 inches; yellowish brown (10YR 5/4) sandy clay loam; moderate medium subangular blocky structure; firm; few fine and medium roots; common discontinuous faint brown (10YR 4/3) clay films on faces of peds; about 3 percent gravel; neutral; clear wavy boundary.

C—31 to 60 inches; light yellowish brown (2.5Y 6/4) sandy loam; massive; about 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 20 to 42 inches
Content of rock fragments: 2 to 15 percent throughout
Other features: Some pedons have an EB, E/B, B/E, or BE horizon.

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam or fine sandy loam

E horizon:
Hue—10YR
Value—5 or 6
Chroma—3 or 4
Texture—loamy sand, loamy fine sand, fine sandy loam, or sandy loam

EB, E/B, B/E, or BE horizon (if it occurs):
Colors—similar to those of the E and Bt horizons
Textures—similar to those of the E and Bt horizons

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—3 or 4
Texture—dominantly sandy clay loam; subhorizons of loam, sandy loam, clay loam, or fine sandy loam in some pedons

C horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 or 4
Texture—sandy loam, fine sandy loam, or loam

267B—Snellman sandy loam, 2 to 8 percent slopes

Composition

Snellman and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: 2 to 8 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Egglake and similar soils
- Bluffton and similar soils
- Cathro and similar soils
- Areas that have slopes of more than 8 percent
- Soils that formed in outwash
- Areas that have stones on the surface

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

267C—Snellman sandy loam, 8 to 15 percent slopes

Composition

Snellman and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 8 to 15 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Egglake and similar soils
- Bluffton and similar soils
- Cathro and similar soils
- Areas that have slopes of more than 15 percent or less than 8 percent
- Soils that formed in outwash
- Areas that have stones on the surface

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

267E—Snellman sandy loam, 15 to 30 percent slopes

Composition

Snellman and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 15 to 30 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained

Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Egglake and similar soils
- Bluffton and similar soils
- Cathro and similar soils
- Soils that have slopes of more than 30 percent or less than 15 percent
- Soils that formed in outwash
- Areas that have stones on the surface

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

267F—Snellman sandy loam, 30 to 45 percent slopes

Composition

Snellman and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 30 to 45 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Egglake and similar soils
- Bluffton and similar soils
- Cathro and similar soils
- Areas that have slopes of more than 45 percent or less than 30 percent
- Soils that formed in outwash
- Areas that have stones on the surface

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

776B—Snellman-Sugarbush complex, 2 to 8 percent slopes

Composition

Snellman and similar soils: About 60 percent
Sugarbush and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: 2 to 8 percent

Component Description

Snellman

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.3 inches
Organic matter content: Moderate

Sugarbush

Texture of the surface layer: Sandy loam

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.6 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bluffcreek and similar soils
- Epoufette and similar soils
- Two Inlets and similar soils
- Wykeham and similar soils
- Egglake and similar soils
- Bluffton and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

776C—Snellman-Sugarbush complex, 8 to 15 percent slopes

Composition

Snellman and similar soils: About 60 percent
Sugarbush and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 8 to 15 percent

Component Description

Snellman

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.1 inches
Organic matter content: Moderate

Sugarbush

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bluffcreek and similar soils
- Epoufette and similar soils
- Two Inlets and similar soils
- Wykeham and similar soils
- Egglake and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

776E—Snellman-Sugarbush complex, 15 to 30 percent slopes

Composition

Snellman and similar soils: About 55 percent
Sugarbush and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders

Slope range: 15 to 30 percent

Component Description

Snellman

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.1 inches
Organic matter content: Moderate

Sugarbush

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.9 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Bluffcreek and similar soils
- Epoufette and similar soils
- Two Inlets and similar soils
- Wykeham and similar soils
- Egglake and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1218B—Snellman-Lida complex, 1 to 8 percent slopes

Composition

Snellman and similar soils: About 55 percent
Lida and similar soils: About 30 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: 1 to 8 percent

Component Description

Snellman

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.5 inches
Organic matter content: Moderate

Lida

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.0 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Egglake and similar soils
- Bluffton and similar soils
- Cathro and similar soils
- Two Inlets and similar soils
- Wykeham and similar soils
- Areas that have stones on the surface

Major Uses of the Unit

- Cropland

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1218C—Snellman-Lida complex, 8 to 15 percent slopes

Composition

Snellman and similar soils: About 45 percent
Lida and similar soils: About 40 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 8 to 15 percent

Component Description

Snellman

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.5 inches
Organic matter content: Moderate

Lida

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Egglake and similar soils
- Bluffton and similar soils
- Cathro and similar soils
- Two Inlets and similar soils
- Wykeham and similar soils
- Areas that have stones on the surface

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1218E—Snellman-Lida complex, 15 to 30 percent slopes

Composition

Snellman and similar soils: About 55 percent
Lida and similar soils: About 30 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 15 to 30 percent

Component Description

Snellman

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.4 inches
Organic matter content: Moderate

Lida

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.1 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Egglake and similar soils
- Bluffton and similar soils
- Cathro and similar soils
- Two Inlets and similar soils
- Wykeham and similar soils
- Areas that have stones on the surface

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1218F—Snellman-Lida complex, 30 to 45 percent slopes

Composition

Snellman and similar soils: About 55 percent
Lida and similar soils: About 30 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 30 to 45 percent

Component Description

Snellman

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.1 inches
Organic matter content: Moderate

Lida

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.6 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Egglake and similar soils
- Bluffton and similar soils
- Cathro and similar soils
- Two Inlets and similar soils
- Wykeham and similar soils
- Areas that have stones on the surface

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Sugarbush Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately rapid; lower part—rapid or very rapid
Landforms: Moraines
Parent material: Glacial outwash
Slope range: 2 to 30 percent
Taxonomic classification: Coarse-loamy, mixed Typic Eutroboralfs

Typical Pedon

Sugarbush sandy loam, in an area of Snellman-Sugarbush complex, 2 to 8 percent slopes, 1,400 feet west and 1,300 feet south of the northeast corner of sec. 15, T. 142 N., R. 40 W., in Becker County, Minnesota:

A—0 to 3 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; about 3 percent gravel; moderately acid; clear smooth boundary.

E—3 to 13 inches; brown (10YR 5/3) loamy sand, very

pale brown (10YR 7/3) dry; weak fine subangular blocky structure; very friable; about 3 percent gravel; slightly acid; gradual smooth boundary.

Bt—13 to 25 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; friable; many continuous distinct dark brown (7.5YR 4/4) clay films on faces of peds and in pores; about 5 percent gravel; slightly acid; clear smooth boundary.

2C—25 to 60 inches; brown (10YR 5/3) gravelly coarse sand; single grain; loose; few coatings of carbonate on the underside of pebbles; about 20 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 15 to 30 inches
Depth to sand and gravel: 15 to 30 inches
Content of rock fragments: 0 to 15 percent in the loamy mantle; 10 to 35 percent in the underlying sediments

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam
Content of rock fragments—0 to 15 percent

E horizon:
Hue—10YR
Value—4 to 6
Chroma—3 or 4
Texture—loamy sand or loamy coarse sand
Content of rock fragments—0 to 15 percent

Bt horizon:
Hue—10YR or 7.5YR
Value—3 to 5
Chroma—3 to 6
Texture—sandy loam or coarse sandy loam
Content of rock fragments—0 to 15 percent

2C horizon:
Hue—10YR or 7.5YR
Value—5 or 6
Chroma—3 to 6
Texture—sand, coarse sand, or the gravelly analogs of these textures
Content of rock fragments—10 to 35 percent

Sverdrup Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately rapid; lower part—rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 18 percent
Taxonomic classification: Sandy, mixed Udic Haploborolls

Typical Pedon

Sverdrup sandy loam, 2 to 6 percent slopes, 200 feet east and 2,620 feet north of the southwest corner of sec. 28, T. 131 N., R. 43 W.

Ap—0 to 9 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak medium and coarse subangular blocky structure; friable; common fine and medium roots; neutral; abrupt smooth boundary.

A—9 to 12 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak fine and medium subangular blocky structure; friable; common fine and very fine roots; neutral; clear wavy boundary.

Bw1—12 to 19 inches; brown (10YR 4/3) sandy loam; weak medium and coarse prismatic structure parting to weak medium and coarse subangular blocky; friable; few fine and very fine roots; very dark grayish brown (10YR 3/2) and very dark brown (10YR 2/2) coatings on faces of prisms; neutral; gradual wavy boundary.

2Bw2—19 to 24 inches; dark grayish brown (10YR 4/2) loamy sand; weak medium subangular blocky structure; friable; few very fine roots; slightly alkaline; clear wavy boundary.

2C1—24 to 31 inches; brown (10YR 4/3) sand; single grain; loose; slightly effervescent; moderately alkaline; clear irregular boundary.

2C2—31 to 48 inches; yellowish brown (10YR 5/4) sand; single grain; loose; few fine rounded soft masses of lime; slightly effervescent; moderately alkaline; clear irregular boundary.

2C3—48 to 60 inches; olive brown (2.5Y 5/3) sand; single grain; loose; slightly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 15 to 44 inches
Thickness of the mollic epipedon: 7 to 16 inches
Thickness of the loamy mantle: 14 to 24 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam
Content of rock fragments—0 to 5 percent

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—fine sandy loam, sandy loam, or loam
Content of rock fragments—0 to 5 percent

2Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 4
Texture—loamy fine sand, loamy sand, fine sand, or sand
Content of rock fragments—0 to 5 percent

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—sand, fine sand, or loamy sand
Content of rock fragments—0 to 10 percent

127A—Sverdrup sandy loam, 0 to 2 percent slopes

Composition

Sverdrup and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flats and slight rises on pitted outwash plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.8 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Fordville and similar soils
- Oylen and similar soils
- Sandberg and similar soils
- Forada and similar soils
- Areas that have slopes of more than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

127B—Sverdrup sandy loam, 2 to 6 percent slopes

Composition

Sverdrup and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Clontarf and similar soils
- Fordville and similar soils
- Sandberg and similar soils
- Forada and similar soils
- Areas that have slopes of more than 6 percent or less than 2 percent
- Very poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

127C—Sverdrup sandy loam, 6 to 12 percent slopes

Composition

Sverdrup and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Clontarf and similar soils
- Fordville and similar soils
- Sandberg and similar soils
- Forada and similar soils
- Areas that have slopes of more than 12 percent or less than 6 percent
- Very poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

1221B—Sverdrup-Sandberg complex, 2 to 6 percent slopes

Composition

Sverdrup and similar soils: About 50 percent
Sandberg and similar soils: About 35 percent
Inclusions: About 15 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Sverdrup

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.8 inches
Organic matter content: Moderate

Sandberg

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Clontarf and similar soils
- Oylen and similar soils
- Forada and similar soils
- Areas that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Swenoda Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderately rapid; lower part—moderately slow or moderate
Landforms: Lake plains and moraines
Parent material: Glaciolacustrine deposits over till
Slope range: 1 to 4 percent
Taxonomic classification: Coarse-loamy, mixed Pachic Udic Haploborolls

Typical Pedon

Swenoda fine sandy loam, 1 to 4 percent slopes, 400 feet north and 2,200 feet west of the southeast corner of sec. 32, T. 132 N., R. 44 W.

Ap—0 to 9 inches; black (10YR 2/1) fine sandy loam, very dark gray (10YR 3/1) dry; weak fine and medium subangular blocky structure; friable; many fine and medium roots; neutral; abrupt smooth boundary.

A—9 to 15 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; friable; many fine and medium roots; neutral; clear smooth boundary.

Bw1—15 to 22 inches; very dark grayish brown (10YR 3/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine and medium subangular blocky structure; friable; many fine and medium roots; neutral; clear smooth boundary.

Bw2—22 to 29 inches; brown (10YR 4/3) fine sandy loam; weak fine subangular blocky structure; friable; many very fine and fine roots; neutral; abrupt smooth boundary.

2Bk—29 to 40 inches; grayish brown (2.5Y 5/2) clay loam; weak coarse prismatic soil fragments; firm; few very fine and fine roots; common medium and coarse prominent yellowish brown (10YR 5/8) and light olive brown (2.5Y 5/6) Fe concentrations; many distinct light gray (10YR 7/2) carbonate coatings on faces of peds and in pores; many fine rounded light gray (10YR 7/2) carbonate nodules; about 2 percent gravel; violently effervescent; moderately alkaline; gradual smooth boundary.

2C—40 to 60 inches; grayish brown (2.5Y 5/2) clay loam; weak coarse prismatic soil fragments; firm; common fine and medium distinct light olive brown (2.5Y 5/6) Fe concentrations; few distinct light gray (10YR 7/2) carbonate coatings on faces of peds and in pores; few fine rounded light gray (10YR 7/2) carbonate nodules; about 2 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 20 to 40 inches
Thickness of the mollic epipedon: 16 to 24 inches
Depth to glacial till: 20 to 40 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam
Content of rock fragments—0 to 3 percent

Bw horizon:
Hue—10YR or 2.5Y
Value—2 to 4
Chroma—1 to 4
Texture—sandy loam or fine sandy loam
Content of rock fragments—0 to 15 percent

2Bk horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—2 to 6
Texture—loam or clay loam
Content of rock fragments—1 to 3 percent

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—loam or clay loam
Content of rock fragments—1 to 10 percent

293B—Swenoda fine sandy loam, 1 to 4 percent slopes

Composition

Swenoda and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landforms: Flats and rises on lake plains and moraines
Slope range: 1 to 4 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained

Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Depth to the water table: 2.5 to 4.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.8 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hamerly and similar soils
- Areas that have slopes of more than 4 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Sybil Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Upper part—moderately rapid; lower part—rapid
Landforms: Kame moraines and pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 30 percent
Taxonomic classification: Coarse-loamy, mixed Mollic Eutroboralfs

Typical Pedon

Sybil loamy sand, in an area of Sybil-Eagleview complex, 2 to 8 percent slopes, 3,850 feet north and 1,400 feet west of the southeast corner of sec. 16, T. 135 N., R. 39 W.

Ap—0 to 5 inches; dark brown (10YR 3/3) loamy sand, brown (10YR 5/3) dry; weak fine and medium granular structure; very friable; common fine roots; slightly acid; clear smooth boundary.
E—5 to 10 inches; dark yellowish brown (10YR 4/4) loamy sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; few fine roots; neutral; clear smooth boundary.
Bt1—10 to 15 inches; dark brown (7.5YR 4/4) sandy loam; moderate fine and medium subangular blocky structure; friable; few fine roots; common continuous distinct dark brown (10YR 3/3) clay films on faces of peds and in pores; common discontinuous prominent white (10YR 8/2) sand coatings on faces of peds; neutral; clear smooth boundary.
Bt2—15 to 23 inches; dark brown (7.5YR 4/4) loamy sand; single grain; loose; few fine roots; common patchy faint dark brown (7.5YR 3/4) clay bridging between sand grains; neutral; gradual smooth boundary.
Bt3—23 to 32 inches; dark yellowish brown (10YR 4/4) loamy sand; single grain; loose; common discontinuous distinct dark brown (7.5YR 4/4) clay occurring as bridges between sand grains and as thin lamellae; neutral; gradual smooth boundary.
C—32 to 80 inches; brown (10YR 5/4) sand; single grain; loose; about 5 percent gravel; neutral.

Range in Characteristics

Depth to carbonates: 40 to more than 60 inches
Content of rock fragments: 0 to 10 percent
Other features: Some pedons have a BE, B/E, or E&Bt horizon either above or below the Bt horizon.

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—loamy sand or sandy loam

E horizon:
Hue—10YR
Value—4 or 5
Chroma—2 to 4
Texture—loamy sand, loamy coarse sand, or loamy fine sand

E&Bt, B/E, or BE horizon (if it occurs):
Colors—similar to those of the E and Bt horizons
Textures—similar to those of the E and Bt horizons

Bt horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—dominantly sandy loam, coarse sandy loam, or fine sandy loam; subhorizons of sandy clay loam, loam, loamy sand, loamy fine sand, or sand in some pedons

2C horizon:
Hue—10YR, 7.5YR, or 2.5Y
Value—5 to 7
Chroma—2 to 6
Texture—sand or coarse sand

1195A—Sybil-Eagleview complex, 0 to 2 percent slopes

Composition

Sybil and similar soils: About 70 percent
Eagleview and similar soils: About 25 percent
Inclusions: About 5 percent

Setting

Landform: Flats on pitted outwash plains
Slope range: 0 to 2 percent

Component Description

Sybil

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.3 inches
Organic matter content: Moderate

Eagleview

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.2 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Bluffcreek and similar soils
- Pinelake and similar soils
- Forada and similar soils
- Areas that have slopes of more than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1195B—Sybil-Eagleview complex, 2 to 8 percent slopes

Composition

Sybil and similar soils: About 60 percent
Eagleview and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landforms: Kame moraines and pitted outwash plains
Position on the landform: Summits and backslopes
Slope range: 2 to 8 percent

Component Description

Sybil

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.0 inches
Organic matter content: Moderate

Eagleview

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.3 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Bluffcreek and similar soils
- Almora and similar soils
- Pinelake and similar soils

- Forada and similar soils
- Nidaros and similar soils
- Areas that have slopes of more than 8 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1195C—Sybil-Eagleview complex, 8 to 15 percent slopes

Composition

Sybil and similar soils: About 60 percent
Eagleview and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landforms: Kame moraines and pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 8 to 15 percent

Component Description

Sybil

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.6 inches
Organic matter content: Moderate

Eagleview

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.3 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Bluffcreek and similar soils
- Almora and similar soils
- Pinelake and similar soils
- Forada and similar soils
- Nidaros and similar soils
- Areas that have slopes of more than 15 percent or less than 8 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1195E—Sybil-Eagleview complex, 15 to 30 percent slopes

Composition

Sybil and similar soils: About 60 percent
Eagleview and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landforms: Kame moraines and pitted outwash plains
Position on the landform: Backslopes and shoulders
Slope range: 15 to 30 percent

Component Description

Sybil

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.6 inches
Organic matter content: Moderate

Eagleview

Texture of the surface layer: Loamy sand

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.7 inches
Organic matter content: Moderately low

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bluffcreek and similar soils
- Almora and similar soils
- Pinelake and similar soils
- Forada and similar soils
- Nidaros and similar soils
- Areas that have slopes of more than 30 percent or less than 15 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Two Inlets Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Upper part—moderately rapid; lower part—rapid or very rapid
Landforms: Kame moraines and pitted outwash plains
Parent material: Glacial outwash
Slope range: 1 to 50 percent
Taxonomic classification: Sandy, mixed Psammentic Eutroboralfs

Typical Pedon

Two Inlets sandy loam, in an area of Lida-Two Inlets complex, 8 to 15 percent slopes, 250 feet south and 1,400 feet east of the northwest corner of sec. 33, T. 136 N., R. 41 W.

A—0 to 4 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; many fine and medium roots; about 2 percent gravel; neutral; abrupt smooth boundary.

E—4 to 9 inches; brown (10YR 4/3) loamy coarse sand, brown (10YR 5/3) dry; weak fine subangular blocky structure; very friable; common fine to coarse roots; many continuous faint dark brown (10YR 3/3) and few patchy faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds and in pores; about 8 percent gravel; neutral; abrupt smooth boundary.

Bt—9 to 11 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few medium roots; common patchy distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; about 5 percent gravel; slightly acid; clear irregular boundary.

E&Bt—11 to 30 inches; sand, dark yellowish brown (10YR 4/4) (E) and dark brown (10YR 3/3) (Bt); weak fine subangular blocky structure; very friable; few medium roots; few discontinuous faint dark brown (10YR 3/3) clay bridging between sand grains; about 5 percent gravel; neutral; gradual wavy boundary.

BC—30 to 38 inches; dark yellowish brown (10YR 3/4) gravelly coarse sand; single grain; loose; few medium roots; few faint dark brown (10YR 3/3) discontinuous clay bridging on sand and gravel; about 34 percent gravel; slightly effervescent; moderately alkaline; gradual irregular boundary.

C—38 to 60 inches; yellowish brown (10YR 5/4) gravelly coarse sand; single grain; loose; about 29 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 14 to 40 inches
Other features: Some pedons have an EB, B/E, BE, or Bk horizon.

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy coarse sand, loamy sand, sandy loam, or coarse sandy loam or the gravelly analogs of these textures
Content of rock fragments—5 to 35 percent

E horizon:
Hue—10YR

Value—3 to 5
Chroma—3 or 4
Texture—loamy sand, loamy coarse sand, sand, or coarse sand or the gravelly analogs of these textures
Content of rock fragments—5 to 35 percent

EB, B/E, or BE horizon (if it occurs):
Colors—similar to those of the E and Bt horizons
Textures—similar to those of the E and Bt horizons

Bt horizon:
Hue—10YR or 7.5YR
Value—3 or 4
Chroma—3 or 4
Texture—dominantly loamy sand, loamy coarse sand, coarse sand, or sand or the gravelly analogs of these textures; thin subhorizons of sandy loam or coarse sandy loam in some pedons
Content of rock fragments—5 to 35 percent

Bk horizon (if it occurs):
Hue—10YR or 2.5Y
Value—4 to 7
Chroma—2 to 6
Texture—dominantly coarse sand, sand, or very coarse sand or the gravelly analogs of these textures; subhorizons that have more than 35 percent gravel in some pedons
Content of rock fragments—5 to 35 percent

C horizon:
Hue—10YR
Value—4 to 6
Chroma—3 to 6
Texture—dominantly coarse sand, sand, or very coarse sand or the gravelly analogs of these textures; subhorizons that have more than 35 percent gravel in some pedons
Content of rock fragments—15 to 35 percent

1015—Udipsamments (cut and fill land)

Composition

Udipsamments: 95 percent
Inclusions: About 5 percent

Setting

Landforms: Outwash plains, lake plains, and moraines
Slope range: 0 to 10 percent

Component Description

Texture of the surface layer: Sand
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches
Organic matter content: Very low

Inclusions

- Poorly drained soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

1016—Udorthents, loamy (cut and fill land)

Composition

Udorthents: 95 percent
Inclusions: About 5 percent

Component Description

Texture of the surface layer: Variable
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Flooding: None
Depth to the water table: Greater than 6.0 feet
Organic matter content: Very low

Inclusions

- Poorly drained soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

1027—Udorthents, wet substratum (fill land)

Composition

Udorthents: 95 percent
Inclusions: About 5 percent

Inclusions

- Moderately well drained soils

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

Urness Series

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow or moderate
Landforms: Moraines
Parent material: Coprogenous earth
Slope range: 0 to 1 percent
Taxonomic classification: Fine-silty, mixed (calcareous), frigid Mollic Fluvaquents

Typical Pedon

Urness mucky silt loam, 900 feet west and 150 feet north of the southeast corner of sec. 33, T. 136 N., R. 44 W.

Ap—0 to 9 inches; black (N 2/0) mucky silt loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; very friable; many fine roots; 5 percent shell fragments; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1—9 to 31 inches; very dark gray (N 3/0) mucky silt loam, gray (10YR 5/1) dry; weak medium subangular blocky structure; very friable; few fine roots; few fine prominent strong brown (7.5YR 4/6) Fe concentrations; 3 percent shell fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—31 to 58 inches; black (10YR 2/1) mucky silt loam, gray (10YR 5/1) dry; weak medium subangular blocky structure; very friable; common medium prominent strong brown (7.5YR 4/6) Fe concentrations; 3 percent shell fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

C3—58 to 60 inches; black (N 2/0) mucky silt loam, very dark gray (10YR 3/1) dry; massive; very friable; few fine prominent strong brown (7.5YR 4/6) Fe concentrations; 3 percent shell fragments; slightly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 6 inches
Content of rock fragments: Typically none throughout

Ap horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 to 4
Chroma—0 to 2
Texture—mucky silt loam

C horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 to 4
Chroma—0 to 2
Texture—loam, silt loam, clay loam, or silty clay loam or the mucky analogs of these textures
Content of shell fragments (by volume)—1 to 25 percent; mostly fragments of snail shells and clam shells 2 to 10 mm in size

335—Urness mucky silt loam

Composition

Urness and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on moraines
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Mucky silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Coprogenous earth
Flooding: None
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 11.6 inches
Organic matter content: Very high

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Roliss and similar soils
- Hamerly and similar soils
- Haslie and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Vallers Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderately slow
Landforms: Lake plains and moraines
Parent material: Till
Slope range: 0 to 2 percent
Taxonomic classification: Fine-loamy, frigid Typic Calciaquolls

Typical Pedon

Vallers silty clay loam, 1,250 feet west and 1,400 feet north of the southeast corner of sec. 28, T. 131 N., R. 38 W.

Ap—0 to 8 inches; black (N 2/0) silty clay loam, black (N 3/0) dry; weak fine and medium subangular blocky structure; friable; common fine and medium roots; about 2 percent gravel; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A—8 to 14 inches; black (N 2/0) silty clay loam, black (10YR 2/1) dry; weak fine subangular blocky structure; friable; common fine and medium roots; about 2 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

Bkg1—14 to 18 inches; gray (5Y 5/1) clay loam; weak fine and medium subangular blocky structure; friable; few fine roots; common fine and medium prominent light olive brown (2.5Y 5/4) Fe concentrations; common fine irregular light gray (10YR 7/2) soft masses of carbonates; about 2 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

Bkg2—18 to 24 inches; olive gray (5Y 5/2) clay loam; weak fine and medium subangular blocky structure; friable; common fine and medium prominent light olive brown (2.5Y 5/6) Fe concentrations; common fine irregular light gray (10YR 7/2) soft masses of carbonates; about 2 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

Cg—24 to 60 inches; light olive gray (5Y 6/2) clay loam; massive; friable; many medium and coarse prominent yellowish brown (10YR 5/6) Fe concentrations; common fine irregular light gray (10YR 7/2) carbonate threads; common fine rounded soft masses of iron; about 2 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Carbonates: At or near the surface
Thickness of the mollic epipedon: 7 to 25 inches
Content of rock fragments: 2 to 8 percent throughout

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silty clay loam

Bkg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 6
Chroma—0 to 2
Texture—clay loam, silty clay loam, or loam

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 7
Chroma—1 to 3
Texture—loam or clay loam

1317—Vallers silty clay loam

Composition

Vallers and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landforms: Flats and swales on lake plains and moraines
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 11.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Quam and similar soils
- Hamerly and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Verndale Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Upper part—moderately rapid; next part—moderate; lower part—rapid
Landform: Pitted outwash plains
Parent material: Glacial outwash
Slope range: 0 to 12 percent
Taxonomic classification: Coarse-loamy, mixed Udic Argiborolls

Typical Pedon

Verndale sandy loam, 0 to 2 percent slopes, 175 feet west and 1,225 feet north of the southeast corner of sec. 30, T. 136 N., R. 39 W.

Ap—0 to 9 inches; black (10YR 2/1) sandy loam, very dark grayish brown (10YR 3/2) dry; weak medium subangular blocky structure; very friable; few fine roots; slightly acid; abrupt smooth boundary.

Bt1—9 to 12 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; common fine roots; common continuous faint brown (10YR 3/3 and 4/3) clay films on faces of peds; about 1 percent gravel; neutral; clear smooth boundary.

Bt2—12 to 18 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; common fine roots; common continuous faint brown (10YR 4/3) clay films on faces of peds; about 1 percent gravel; neutral; clear smooth boundary.

2Bt3—18 to 21 inches; dark yellowish brown (10YR 4/4) loamy sand; weak coarse subangular blocky structure; very friable; few fine roots; few patchy faint brown (10YR 4/3) clay bridging between sand grains; about 1 percent gravel; neutral; clear smooth boundary.

2Bw—21 to 38 inches; yellowish brown (10YR 5/6) sand; single grain; loose; about 2 percent gravel; neutral; clear smooth boundary.

2C1—38 to 43 inches; yellowish brown (10YR 5/4) sand; single grain; loose; about 1 percent gravel; slightly effervescent; slightly alkaline; clear smooth boundary.

2C2—43 to 60 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; about 1 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 24 to more than 50 inches
Thickness of the mollic epipedon: 7 to 16 inches
Thickness of the loamy mantle: 14 to 22 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam
Content of rock fragments—0 to 8 percent gravel

Bt horizon:
Hue—10YR
Value—3 to 5
Chroma—3 or 4
Texture—sandy loam, coarse sandy loam, fine sandy loam, or loam
Content of rock fragments—0 to 8 percent gravel

2Bt horizon:
Hue—10YR, 7.5YR, or 2.5Y
Value—4 or 5
Chroma—3 to 6
Texture—loamy sand or loamy coarse sand
Content of rock fragments—0 to 15 percent gravel

2Bw horizon:
Hue—10YR, 7.5YR, or 2.5Y
Value—4 or 5
Chroma—3 to 6
Texture—loamy sand, loamy coarse sand, sand, or coarse sand
Content of rock fragments—0 to 15 percent gravel

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 7
Chroma—2 to 4
Texture—sand or coarse sand
Content of rock fragments—0 to 15 percent gravel

567A—Verndale sandy loam, 0 to 2 percent slopes

Composition

Verndale and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Flats on pitted outwash plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.3 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Abbeylake and similar soils
- Almora and similar soils
- Oylen and similar soils
- Pinelake and similar soils
- Areas that have slopes of more than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

567B—Verndale sandy loam, 2 to 6 percent slopes

Composition

Verndale and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.8 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Abbeylake and similar soils
- Almora and similar soils
- Oylen and similar soils
- Pinelake and similar soils
- Areas that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1131B—Verndale-Abbeylake complex, 1 to 6 percent slopes

Composition

Verndale and similar soils: About 60 percent
Abbeylake and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Pitted outwash plains
Position on the landform: Summits and backslopes
Slope range: 1 to 6 percent

Component Description

Verndale

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Glacial outwash

Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.5 inches
Organic matter content: Moderate

Abbeylake

Texture of the surface layer: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.9 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Oylen and similar soils
- Pinelake and similar soils
- Forada and similar soils
- Nidaros and similar soils
- Areas that have slopes of more than 6 percent or less than 1 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

W—Water

General Description

- Naturally occurring basins of surface water

1356—Water, miscellaneous

Composition

Water: 95 percent
Inclusions: About 5 percent

General Description

- Small manmade areas that are used for industrial, sanitary, or mining applications and that contain water most of the year

Inclusions

- Dike banks

Waukon Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Moraines
Parent material: Till
Slope range: 1 to 35 percent
Taxonomic classification: Fine-loamy, mixed Mollic Eutroboralfs

Typical Pedon

Waukon loam, 6 to 12 percent slopes, eroded, 2,400 feet west and 2,420 feet south of the northeast corner of sec. 27, T. 131 N., R. 38 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak fine and medium subangular blocky structure; friable; common medium and fine roots; about 3 percent gravel; neutral; abrupt smooth boundary.

Bt1—8 to 17 inches; brown (10YR 4/3) clay loam; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; firm; few fine roots; common continuous faint dark brown (10YR 3/3) clay films on faces of peds; common discontinuous faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds; about 3 percent gravel; neutral; clear wavy boundary.

Bt2—17 to 27 inches; brown (10YR 4/3) clay loam; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few fine roots; many discontinuous faint very dark grayish brown (10YR 3/2) clay films on faces of peds; common discontinuous distinct very dark brown (10YR 2/2) organic coatings in root channels; about 3 percent gravel; neutral; gradual wavy boundary.

Bk—27 to 34 inches; light olive brown (2.5Y 5/4) loam; weak medium subangular blocky structure; firm; few fine roots; few patchy prominent very dark brown (10YR 2/2) organic coatings in root channels; many fine irregular carbonate threads; few fine rounded iron-manganese concretions;

about 3 percent gravel; strongly effervescent; slightly alkaline; gradual wavy boundary.

C—34 to 60 inches; light olive brown (2.5Y 5/4) loam; massive; firm; few fine irregular light gray (10YR 7/2) carbonate threads; few fine rounded soft masses of iron; about 3 percent gravel; slightly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 18 to 48 inches
Content of rock fragments: 2 to 8 percent throughout

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 to 6
Texture—loam or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 or 4
Texture—loam or clay loam

C horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—3 or 4
Texture—loam or clay loam

38B—Waukon loam, 2 to 6 percent slopes

Composition

Waukon and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.6 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Gonvick and similar soils
- Quam and similar soils
- Cathro and similar soils
- Areas that have slopes of more than 6 percent
- Soils in which carbonates are closer to the surface than in the Waukon soil

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

38C2—Waukon loam, 6 to 12 percent slopes, eroded

Composition

Waukon and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.6 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Gonvick and similar soils
- Areas that have stones on the surface
- Cathro and similar soils
- Areas that have slopes of more than 12 percent or less than 6 percent
- Soils in which carbonates are closer to the surface than in the Waukon soil

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

38D2—Waukon loam, 12 to 20 percent slopes, eroded

Composition

Waukon and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.6 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Gonvick and similar soils
- Areas that have stones on the surface
- Cathro and similar soils
- Areas that have slopes of more than 20 percent or less than 12 percent
- Soils in which carbonates are closer to the surface than in the Waukon soil

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

38E—Waukon loam, 20 to 30 percent slopes

Composition

Waukon and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 20 to 30 percent

Component Description

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Quam and similar soils
- Cathro and similar soils
- Areas that have slopes of less than 20 percent
- Areas that have stones on the surface
- Soils in which carbonates are closer to the surface than in the Waukon soil

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1104B—Waukon-Dorset complex, 1 to 6 percent slopes

Composition

Waukon and similar soils: About 55 percent
Dorset and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Summits and backslopes
Slope range: 1 to 6 percent

Component Description

Waukon

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: High

Dorset

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.0 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Gonvick and similar soils
- Peever and similar soils
- Corliss and similar soils
- Almora and similar soils
- Parnell and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1104C—Waukon-Dorset complex, 6 to 12 percent slopes, eroded

Composition

Waukon and similar soils: About 55 percent
Dorset and similar soils: About 35 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Waukon

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches

Organic matter content: High

Dorset

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Gonvick and similar soils
- Peever and similar soils
- Corliss and similar soils
- Almora and similar soils
- Parnell and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1104D—Waukon-Dorset complex, 12 to 20 percent slopes, eroded

Composition

Waukon and similar soils: About 50 percent
Dorset and similar soils: About 35 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Waukon

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: High

Dorset

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Gonvick and similar soils
- Peever and similar soils
- Corliss and similar soils
- Almora and similar soils
- Parnell and similar soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1217E—Waukon-Lida complex, 20 to 35 percent slopes

Composition

Waukon and similar soils: About 50 percent
Lida and similar soils: About 35 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 20 to 35 percent

Component Description

Waukon

Texture of the surface layer: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.6 inches
Organic matter content: High

Lida

Texture of the surface layer: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glacial outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Parnell and similar soils
- Cathro and similar soils
- Two Inlets and similar soils
- Areas that have stones on the surface
- Areas that have slopes of less than 20 percent

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Weetown Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Moraines
Parent material: Colluvium over till
Slope range: 1 to 3 percent
Taxonomic classification: Fine-loamy, mixed Pachic Udic Argiborolls

Typical Pedon

Weetown fine sandy loam, in an area of Friberg-Weetown complex, 250 feet west and 550 feet north of the southeast corner of sec. 32, T. 134 N., R. 42 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) fine sandy loam, very dark grayish brown (10YR 3/2) dry; weak fine and medium subangular blocky structure; friable; common fine and medium roots; about 1 percent gravel; neutral; abrupt smooth boundary.

A—9 to 27 inches; black (10YR 2/1) fine sandy loam, very dark gray (10YR 3/1) dry; weak fine and medium subangular blocky structure; friable; common fine and medium roots; about 1 percent gravel; neutral; clear wavy boundary.

BE—27 to 31 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; friable; common fine and medium roots; about 2 percent gravel; neutral; gradual wavy boundary.

Bt1—31 to 41 inches; dark yellowish brown (10YR 4/4) loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common fine distinct yellowish brown (10YR 5/6) Fe concentrations; common very fine and fine roots; common fine distinct dark grayish brown (10YR 4/2) clay films on faces of peds and in pores; about 3 percent gravel; slightly acid; clear wavy boundary.

Bt2—41 to 51 inches; dark brown (10YR 3/3) loam; moderate medium subangular blocky structure;

friable; common medium distinct yellowish brown (10YR 5/6) Fe concentrations and common fine prominent grayish brown (2.5Y 5/2) Fe depletions; common fine faint very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; few fine and medium soft masses of iron oxide; about 3 percent gravel; slightly acid; gradual smooth boundary.

Bk—51 to 60 inches; olive brown (2.5Y 4/4) fine sandy loam; weak medium subangular blocky structure; friable; common fine and medium distinct grayish brown (2.5Y 5/2) Fe depletions and few medium prominent yellowish brown (10YR 5/6) Fe concentrations; about 5 percent gravel; common fine and medium light gray (10YR 7/2) carbonate threads; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 25 to more than 60 inches
Thickness of the mollic epipedon: 16 to 48 inches
Content of rock fragments: 1 to 10 percent throughout

Ap or A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—sandy loam, fine sandy loam, loam, or silt loam

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—3 or 4
Texture—sandy clay loam, sandy loam, fine sandy loam, or loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—sandy loam, fine sandy loam, or loam

Winger Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Upper part—moderate; lower part—moderately slow or moderate
Landforms: Lake plains and moraines
Parent material: Glaciolacustrine deposits over till
Slope range: 0 to 1 percent
Taxonomic classification: Fine-silty, frigid Typic Calciaquolls

Typical Pedon

Winger silt loam, 2,000 feet east and 200 feet north of the southwest corner of sec. 7, T. 132 N., R. 44 W.

Ap—0 to 10 inches; black (N 2/0) silt loam, very dark gray (N 3/0) dry; weak fine and medium angular blocky structure; friable; many very fine and fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Ak—10 to 16 inches; very dark gray (N 2/0) silty clay loam, dark gray (N 4/0) dry; weak fine and medium angular blocky structure; friable; common very fine and fine roots; many very fine and fine light gray (10YR 7/2) carbonate threads; strongly effervescent; moderately alkaline; clear smooth boundary.

Bkg1—16 to 21 inches; gray (5Y 5/1) silty clay loam; weak fine and medium angular blocky structure; firm; common very fine and fine roots; few fine carbonate threads; violently effervescent; moderately alkaline; clear smooth boundary.

Bkg2—21 to 29 inches; gray (5Y 5/1) silty clay loam; weak fine and medium angular blocky structure; firm; few very fine and fine roots; strongly effervescent; moderately alkaline; clear wavy boundary.

2Cgy—29 to 60 inches; pale olive (5Y 6/3) clay loam; massive; firm; common very fine and fine prominent dark yellowish brown (10YR 4/6) Fe concentrations; common very fine and fine light gray (10YR 7/2) carbonate threads; common fine and medium nests of gypsum; about 3 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Carbonates: At or near the surface
Thickness of the mollic epipedon: 8 to 24 inches
Depth to glacial till: 24 to 40 inches

Ap horizon:
Hue—10YR to 5Y or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silt loam

Ak horizon:
Hue—10YR to 5Y or neutral
Value—2 or 3
Chroma—0 or 1
Texture—silt loam or silty clay loam

Bkg horizon:
Hue—2.5Y or 5Y
Value—4 to 6

Chroma—1 or 2
Texture—silt loam, silty clay loam, or loam

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 3
Texture—silt loam or silty clay loam

2Cgy horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 to 3
Texture—loam or clay loam
Content of rock fragments—2 to 10 percent

107—Winger silt loam

Composition

Winger and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landforms: Flats and swales on lake plains and moraines
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Depth to the water table: 0.5 foot to 1.5 feet
Available water capacity to 60 inches or root-limiting layer: About 11.8 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Quam and similar soils
- McIntosh and similar soils
- Soils in which carbonates have been leached to the subsoil
- Soils that have a loamy surface layer and subsoil

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Wolverton Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderately rapid; next part—rapid; lower part—moderately slow
Landform: Lake plains
Parent material: Glaciolacustrine deposits over till
Slope range: 0 to 2 percent
Taxonomic classification: Coarse-loamy, mixed Aquic Calciborolls

Typical Pedon

Wolverton very fine sandy loam, 2,375 feet west and 1,250 feet north of the southeast corner of sec. 31, T. 133 N., R. 44 W.

Ap—0 to 8 inches; black (10YR 2/1) very fine sandy loam, very dark gray (10YR 3/1) dry; weak fine and medium subangular blocky structure; friable; few fine and very fine roots; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Ak—8 to 16 inches; very dark gray (10YR 3/1) very fine sandy loam, dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure; friable; few fine and very fine roots; many very fine soft masses of carbonate; violently effervescent; moderately alkaline; clear smooth boundary.

Bk1—16 to 27 inches; olive brown (2.5Y 4/2) very fine sandy loam; weak fine and medium subangular blocky structure; friable; common fine and very fine roots; common fine irregular carbonate threads; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—27 to 34 inches; olive brown (2.5Y 4/3) very fine sandy loam; weak fine and medium subangular blocky structure; very friable; common fine distinct light yellowish brown (2.5Y 6/3) Fe concentrations; common fine irregular carbonate threads; violently effervescent; moderately alkaline; clear smooth boundary.

2Bkgy—34 to 45 inches; grayish brown (2.5Y 5/2) clay loam; weak medium prismatic structure parting to weak fine subangular blocky; firm; common fine and medium prominent dark yellowish brown (10YR 4/6) Fe concentrations; many fine and medium irregular nests of gypsum; common fine

irregular carbonate threads; common fine rounded soft masses of iron manganese; about 2 percent gravel; violently effervescent; moderately alkaline; clear smooth boundary.

2Cg—45 to 80 inches; grayish brown (2.5Y 5/2) clay loam; weak medium prismatic soil fragments; firm; many fine and medium prominent dark yellowish brown (10YR 4/6) Fe concentrations; common medium irregular nests of gypsum; common fine rounded soft masses of iron manganese; about 2 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: At the surface
Thickness of the mollic epipedon: 7 to 16 inches
Depth to fine-loamy glacial till: 20 to 40 inches
Content of rock fragments: Generally none in the upper part; 1 to 10 percent in the underlying glacial till

Ap or Ak horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam

Bk horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—1 to 4
Texture—loamy very fine sand, loamy fine sand, loamy sand, very fine sandy loam, fine sandy loam, or sandy loam

2C horizon:
Hue—2.5Y
Value—5 or 6
Chroma—1 to 4
Texture—clay loam, silty clay loam, or loam
Content of rock fragments—1 to 10 percent

1322—Wolverton very fine sandy loam

Composition

Wolverton and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on lake plains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Very fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits over till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 7.4 inches
Organic matter content: Moderate

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Hamerly and similar soils
- Doran and similar soils
- Mustinka and similar soils
- Rockwell and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Wykeham Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Upper part—moderate or moderately rapid; lower part—moderate
Landform: Moraines
Parent material: Till
Slope range: 1 to 5 percent
Taxonomic classification: Fine-loamy, mixed Aquic Eutroboralfs

Typical Pedon

Wykeham fine sandy loam, 2,000 feet north and 2,200 feet east of the southwest corner of sec. 12, T. 131 N., R. 36 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; common very fine and fine roots; about 2 percent gravel; slightly acid; abrupt smooth boundary.

B/E—8 to 14 inches; sandy loam, about 90 percent

dark yellowish brown (10YR 4/4) (Bt) and 10 percent brown (10YR 5/3) (E); weak medium subangular blocky structure; very friable; few very fine and fine roots; about 2 percent gravel; neutral; clear smooth boundary.

Bt1—14 to 21 inches; dark yellowish brown (10YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; few very fine and fine roots; common faint dark brown (10YR 3/3) clay films on faces of peds; few fine distinct grayish brown (10YR 5/2) Fe depletions and common fine distinct yellowish brown (10YR 5/8) Fe concentrations; about 2 percent gravel; neutral; clear smooth boundary.

Bt2—21 to 28 inches; dark yellowish brown (10YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; few very fine and fine roots; common distinct very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; common medium prominent grayish brown (2.5Y 5/2) Fe depletions and common medium distinct yellowish brown (10YR 5/8) Fe concentrations; about 2 percent gravel; neutral; clear smooth boundary.

BC—28 to 31 inches; yellowish brown (10YR 5/4) sandy loam; weak thick platy structure; friable; few very fine and fine roots; common prominent grayish brown (2.5Y 5/2) clay films in pores; common fine distinct yellowish brown (10YR 5/8) Fe concentrations; few light gray (10YR 7/2) carbonate threads; about 5 percent gravel; neutral; clear smooth boundary.

C—31 to 60 inches; light olive brown (2.5Y 5/4) sandy loam; massive; weak thick platy soil aggregates; friable; few fine prominent yellowish red (5YR 5/8) Fe concentrations; common light gray (10YR 7/2) carbonate threads; about 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 20 to 50 inches

A or Ap horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—fine sandy loam
Content of rock fragments—2 to 15 percent

E horizon:
Hue—10YR
Value—4 or 5
Chroma—2 to 4
Texture—sandy loam, fine sandy loam, loamy fine sand, or loamy sand
Content of rock fragments—2 to 15 percent

EB, E/B, B/E, or BE horizon (if it occurs):
Colors—similar to those of the E and Bt horizons
Textures—similar to those of the E and Bt horizons

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 to 8
Texture—sandy loam, fine sandy loam, sandy clay loam, or loam
Content of rock fragments—2 to 20 percent

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 to 6
Texture—sandy loam or fine sandy loam
Content of rock fragments—2 to 20 percent

121—Wykeham fine sandy loam

Composition

Wykeham and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Moraines
Position on the landform: Footslopes and toeslopes
Slope range: 1 to 3 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Till
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 8.5 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Egglake and similar soils
- Bluffton and similar soils
- Cathro and similar soils
- Snellman and similar soils

- Soils that formed in outwash
- Areas that have stones on the surface

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Wyndmere Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately rapid
Landform: Lake plains
Parent material: Glaciolacustrine deposits
Slope range: 0 to 3 percent
Taxonomic classification: Coarse-loamy, frigid Aeric Calciaquolls

Typical Pedon

Wyndmere fine sandy loam, 1,900 feet east and 2,500 feet north of the southwest corner of sec. 29, T. 131 N., R. 44 W.

Ap—0 to 12 inches; black (10YR 2/1) fine sandy loam, very dark gray (10YR 3/1) dry; weak coarse subangular blocky structure; very friable; common fine and very fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Abk—12 to 16 inches; very dark gray (10YR 3/1) fine sandy loam, dark grayish brown (2.5Y 4/2) dry; weak coarse subangular blocky structure; very friable; common fine and very fine roots; many prominent light brownish gray (2.5Y 6/2) carbonate coatings on faces of peds; violently effervescent; strongly alkaline; gradual wavy boundary.

Bk1—16 to 27 inches; olive brown (2.5Y 4/3) fine sandy loam; weak medium subangular blocky structure; very friable; few fine and very fine roots; few fine prominent gray (5Y 5/1) Fe depletions and few fine distinct light olive brown (2.5Y 5/6) Fe concentrations; common distinct light gray (2.5Y 7/2) carbonate coatings; violently effervescent; strongly alkaline; gradual wavy boundary.

Bk2—27 to 38 inches; olive gray (5Y 5/2) fine sandy loam; weak medium subangular blocky structure; very friable; few very fine roots; many distinct white (5Y 8/1) carbonate coatings on faces of peds; strongly effervescent; moderately alkaline; gradual wavy boundary.

C1—38 to 42 inches; light olive brown (2.5Y 5/4) fine sand; single grain; loose; few fine distinct light olive brown (2.5Y 5/6) Fe concentrations; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—42 to 60 inches; grayish brown (2.5Y 5/2) fine sand; single grain; loose; few fine distinct light olive brown (2.5Y 5/6) Fe concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Carbonates: At or near the surface
Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: Typically none throughout

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam

Bk horizon:
Hue—10YR to 5Y
Value—3 to 6
Chroma—1 to 3
Texture—fine sandy loam or sandy loam

C horizon:
Hue—10YR to 5Y
Value—4 to 7
Chroma—2 to 4
Texture—silt loam, fine sandy loam, loamy fine sand, or fine sand

508—Wyndmere fine sandy loam

Composition

Wyndmere and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flats and slight rises on lake plains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Glaciolacustrine deposits

Flooding: None
Depth to the water table: 1.5 to 3.5 feet
Available water capacity to 60 inches or root-limiting layer: About 7.9 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Borup and similar soils
- Wolverton and similar soils
- Soils that have carbonates in the substratum
- Very poorly drained soils
- Cathro and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Zell Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Moraines
Parent material: Glaciolacustrine deposits
Slope range: 2 to 20 percent
Taxonomic classification: Coarse-silty, mixed Udic Calciborolls

Typical Pedon

Zell silt loam, in an area of Zell-Rothsay complex, 6 to 12 percent slopes, eroded, 225 feet west and 150 feet north of the southeast corner of sec. 28, T. 134 N., R. 44 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; many fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bk1—8 to 18 inches; light yellowish brown (2.5Y 6/4) silt loam; weak medium subangular blocky structure; friable; few fine roots; few distinct light gray (2.5Y 7/2) carbonate coatings on faces of peds; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—18 to 31 inches; light yellowish brown (2.5Y 6/4) silt loam; weak medium subangular blocky structure; friable; few very fine roots; few fine prominent yellowish brown (10YR 5/6) relict Fe concentrations; few distinct light gray (2.5Y 7/2) carbonate coatings on faces of peds; violently effervescent; moderately alkaline; clear smooth boundary.

C—31 to 60 inches; light olive brown (2.5Y 5/4) silt loam; common medium prominent yellowish brown (10YR 5/6) relict Fe concentrations; weak medium platy soil fragments; friable; strongly effervescent; moderately alkaline.

Range in Characteristics

Carbonates: At or near the surface
Thickness of the mollic epipedon: 7 to 16 inches
Content of rock fragments: Typically none throughout

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1
Texture—silt loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—silt loam, loam, or very fine sandy loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—silt loam, loam, or very fine sandy loam

969C2—Zell-Rothsay complex, 6 to 12 percent slopes, eroded

Composition

Zell and similar soils: About 50 percent
Rothsay and similar soils: About 35 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Zell

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: Moderate

Rothsay

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.7 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Hantho and similar soils
- Quam and similar soils
- Lakepark and similar soils
- Areas that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

969D2—Zell-Rothsay complex, 12 to 20 percent slopes, eroded

Composition

Zell and similar soils: About 60 percent
Rothsay and similar soils: About 25 percent
Inclusions: About 15 percent

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders
Slope range: Zell—12 to 20 percent; Rothsay—12 to 18 percent

Component Description

Zell

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches
Organic matter content: Moderate

Rothsay

Texture of the surface layer: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches
Organic matter content: High

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Hantho and similar soils
- Quam and similar soils
- Lakepark and similar soils
- Cathro and similar soils
- Areas that have slopes of more than 20 percent or less than 12 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Soil Survey of Otter Tail County, Minnesota

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

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

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

Interpretive ratings help engineers, planners, and others understand how soil properties influence important nonagricultural uses, such as building site development and construction materials. The ratings indicate the most restrictive soil features affecting the suitability of the soils for these uses.

Soils are rated in their natural state. No unusual modification of the soil site or material is made other than that which is considered normal practice for the rated use. Even though soils may have limitations, it is important to remember that engineers and others can modify soil features or can design or adjust the plans for a structure to compensate for most of the limitations. Most of these practices, however, are costly. The final decision in selecting a site for a particular use generally involves weighing the costs of site preparation and maintenance.

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

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

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

The classification and extent of the soils in this survey area are shown in the tables “Classification of the Soils” and “Acreage and Proportionate Extent of the Soils,” which are at the end of this section.

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
Aazdahl	Aquic Haploborolls, fine-loamy, mixed
Abbeylake	Typic Udipsamments, mixed, frigid
Almora	Boralfic Udic Argiborolls, fine-loamy over sandy or sandy-skeletal, mixed
Aquolls	Aquolls
Arveson	Typic Calciaquolls, coarse-loamy, frigid
Arvilla	Udic Haploborolls, sandy, mixed
Barnes	Udic Haploborolls, fine-loamy, mixed
Becida	Mollic Glossaqualfs, coarse-loamy, mixed, frigid
Bemidji	Aquic Arenic Eutroboralfs, loamy, mixed
Blowers	Glossaquic Eutroboralfs, coarse-loamy, mixed
Bluffcreek	Oxyaquic Eutroboralfs, coarse-loamy, mixed
Bluffton	Typic Endoaquolls, fine-loamy, mixed, frigid
Borup	Typic Calciaquolls, coarse-silty, frigid
Brandsvold	Typic Argiaquolls, fine-loamy, mixed, frigid
Buse	Udic Calciborolls, fine-loamy, mixed
Bygland	Aquertic Argiborolls, fine, montmorillonitic
Cathro	Terric Borosaprists, loamy, mixed, euic
Chapett	Boralfic Udic Argiborolls, fine-loamy, mixed
Clearriver	Aquic Udipsamments, mixed, frigid
Clitherall	Aquic Argiborolls, coarse-loamy, mixed
Clontarf	Pachic Udic Haploborolls, coarse-loamy, mixed
Clotho	Typic Endoaquolls, coarse-loamy, mixed (calcareous), frigid
Corliss	Typic Udipsamments, mixed, frigid
Darnen	Pachic Udic Haploborolls, fine-loamy, mixed
Dent	Aquic Argiborolls, fine-silty, mixed
Dickey	Udorthentic Haploborolls, sandy over loamy, mixed
Doran	Aquertic Argiborolls, fine, montmorillonitic
Dorset	Udic Argiborolls, coarse-loamy, mixed
Duelm	Aquic Haploborolls, sandy, mixed
Eagleview	Argic Udipsamments, mixed, frigid
Egeland	Udic Haploborolls, coarse-loamy, mixed
Egglake	Mollic Endoaqualfs, fine-loamy, mixed, frigid
Epoufette	Mollic Endoaqualfs, coarse-loamy, mixed, frigid
Flaming	Aquic Haploborolls, sandy, mixed
Foldahl	Aquic Haploborolls, sandy over loamy, mixed
Forada	Typic Endoaquolls, coarse-loamy, mixed, frigid
Fordville	Pachic Udic Haploborolls, fine-loamy over sandy or sandy-skeletal, mixed
Forman	Udic Argiborolls, fine-loamy, mixed
Formdale	Udic Haploborolls, fine-loamy, mixed
Foxhome	Aquic Haploborolls, sandy-skeletal over loamy, mixed
Friberg	Typic Argiaquolls, fine-loamy, mixed, frigid
Glyndon	Aeric Calciaquolls, coarse-silty, frigid
Gonvick	Aquic Argiborolls, fine-loamy, mixed
Grimstad	Aeric Calciaquolls, sandy over loamy, frigid
Hamerly	Aeric Calciaquolls, fine-loamy, frigid
*Hangaard	Typic Endoaquolls, sandy, mixed, frigid
Hantho	Pachic Udic Haploborolls, coarse-silty, mixed
Haslie	Limnic Borosaprists, coprogenous, euic
Haug	Histic Humaquepts, coarse-loamy, mixed (calcareous), frigid
Heimdal	Udic Haploborolls, coarse-loamy, mixed
Hillview	Mollic Endoaqualfs, coarse-loamy, mixed, frigid
Hubbard	Udorthentic Haploborolls, sandy, mixed
Isan	Typic Endoaquolls, sandy, mixed, frigid
Kandota	Mollic Eutroboralfs, fine-loamy, mixed
Kittson	Aquic Haploborolls, fine-loamy, mixed
Knute	Aquic Argiborolls, fine-loamy, mixed
Kratka	Typic Epiaquolls, sandy over loamy, mixed, frigid
Lakepark	Cumulic Endoaquolls, fine-loamy, mixed, frigid
Lamoure	Cumulic Endoaquolls, fine-silty, mixed (calcareous), frigid
Langhei	Typic Eutrochrepts, fine-loamy, mixed, frigid

Classification of the Soils--Continued

Soil name	Family or higher taxonomic class
Leaflake	Arenic Eutroboralfs, loamy, mixed
Leafriver	Histic Humaquepts, sandy, mixed, frigid
Lida	Mollic Eutroboralfs, coarse-loamy, mixed
Lindaas	Typic Argiaquolls, fine, montmorillonitic, frigid
Lizzie	Boralfic Udic Argiborolls, fine-silty, mixed
Mahkonce	Aquic Eutroboralfs, fine, montmorillonitic
McIntosh	Aeric Calciaquolls, fine-silty, frigid
Meehan	Aquic Udipsamments, mixed, frigid
Mehurin	Aquertic Argiborolls, fine, montmorillonitic
Mustinka	Typic Argiaquolls, fine, montmorillonitic, frigid
Naytahwaush	Mollic Eutroboralfs, fine, montmorillonitic
Nidaros	Terric Borosaprists, loamy, mixed, euic
Nitche	Mollic Eutroboralfs, coarse-loamy, mixed
Oakcreek	Aquic Argiborolls, fine-loamy, mixed
Oylen	Aquic Argiborolls, coarse-loamy, mixed
Paddock	Udollic Epiaqualfs, coarse-loamy, mixed, frigid
Parnell	Vertic Argiaquolls, fine, montmorillonitic, frigid
Peever	Udic Argiborolls, fine, montmorillonitic
Pinelake	Typic Argiaquolls, coarse-loamy, mixed, frigid
Quam	Cumulic Endoaquolls, fine-silty, mixed, frigid
Radium	Aquic Haploborolls, sandy, mixed
Rifle	Typic Borohemists, euic
Rockwell	Typic Calciaquolls, coarse-loamy, frigid
Rockwood	Mollic Eutroboralfs, coarse-loamy, mixed
Roliss	Typic Endoaquolls, fine-loamy, mixed (calcareous), frigid
Roscommon	Mollic Psammaquents, mixed, frigid
Rosy	Glossaquic Eutroboralfs, coarse-loamy, mixed
Rothsay	Udic Haploborolls, coarse-silty, mixed
Runeberg	Typic Endoaquolls, coarse-loamy, mixed, frigid
Rushlake	Aquic Udipsamments, mixed, frigid
Sandberg	Udorthentic Haploborolls, sandy, mixed
Sedgeville	Fluvaquentic Endoaquolls, coarse-loamy, mixed, frigid
Seelyeville	Typic Borosaprists, euic
Sioux	Udorthentic Haploborolls, sandy-skeletal, mixed
Sisseton	Typic Eutrochrepts, coarse-loamy, mixed, frigid
Snellman	Typic Eutroboralfs, fine-loamy, mixed
Sugarbush	Typic Eutroboralfs, coarse-loamy, mixed
Sverdrup	Udic Haploborolls, sandy, mixed
Swenoda	Pachic Udic Haploborolls, coarse-loamy, mixed
Sybil	Mollic Eutroboralfs, coarse-loamy, mixed
Two Inlets	Psammentic Eutroboralfs, sandy, mixed
Udipsamments	Udipsamments
Udorthents	Udorthents
Urness	Mollic Fluvaquents, fine-silty, mixed (calcareous), frigid
Vallers	Typic Calciaquolls, fine-loamy, frigid
Verndale	Udic Argiborolls, coarse-loamy, mixed
Waukon	Mollic Eutroboralfs, fine-loamy, mixed
Weetown	Pachic Udic Argiborolls, fine-loamy, mixed
Winger	Typic Calciaquolls, fine-silty, frigid
Wolverton	Aquic Calciborolls, coarse-loamy, mixed
Wykeham	Aquic Eutroboralfs, fine-loamy, mixed
Wyndmere	Aeric Calciaquolls, coarse-loamy, frigid
Zell	Udic Calciborolls, coarse-silty, mixed

Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
7A	Hubbard loamy sand, 0 to 2 percent slopes	7,740	0.5
7B	Hubbard loamy sand, 2 to 6 percent slopes	14,297	1.0
7C	Hubbard loamy sand, 6 to 12 percent slopes	4,362	0.3
26	Aazdahl clay loam	9,254	0.6
34	Parnell silty clay loam, depressional	6,362	0.4
38B	Waukon loam, 2 to 6 percent slopes	8,073	0.6
38C2	Waukon loam, 6 to 12 percent slopes, eroded	9,893	0.7
38D2	Waukon loam, 12 to 20 percent slopes, eroded	3,229	0.2
38E	Waukon loam, 20 to 30 percent slopes	2,506	0.2
46	Borup loam	271	*
53B	Kandota sandy loam, 2 to 6 percent slopes	29,873	2.1
53C	Kandota sandy loam, 6 to 12 percent slopes	10,893	0.8
53D	Kandota sandy loam, 12 to 20 percent slopes	1,909	0.1
58	Kittson loam	1,338	*
59	Grimstad fine sandy loam	548	*
61	Arveson loam	1,350	*
63	Rockwell loam	4,579	0.3
65	Foxhome sandy loam	484	*
66	Flaming loamy fine sand	102	*
68	Arveson loam, depressional	3,157	0.2
107	Winger silt loam	522	*
108	McIntosh silt loam	110	*
121	Wykeham fine sandy loam	6,652	0.5
127A	Sverdrup sandy loam, 0 to 2 percent slopes	1,147	*
127B	Sverdrup sandy loam, 2 to 6 percent slopes	3,663	0.2
127C	Sverdrup sandy loam, 6 to 12 percent slopes	1,064	*
141B	Egeland fine sandy loam, 1 to 6 percent slopes	2,771	0.2
141C	Egeland fine sandy loam, 6 to 12 percent slopes	1,450	0.1
141D	Egeland fine sandy loam, 12 to 20 percent slopes	428	*
168B	Forman clay loam, 2 to 6 percent slopes	7,929	0.6
180	Gonvick loam	4,483	0.3
184	Hamerly loam	2,066	0.1
187	Haug muck	407	*
191	Epoufette sandy loam	8,315	0.6
202	Meehan loamy sand	1,009	*
258A	Sandberg loamy sand, 0 to 2 percent slopes	10,194	0.7
258B	Sandberg loamy sand, 1 to 6 percent slopes	2,121	0.1
258C	Sandberg loamy sand, 6 to 12 percent slopes	1,735	0.1
260	Duelm loamy sand	2,217	0.2
267B	Snellman sandy loam, 2 to 8 percent slopes	13,321	0.9
267C	Snellman sandy loam, 8 to 15 percent slopes	15,906	1.1
267E	Snellman sandy loam, 15 to 30 percent slopes	10,315	0.7
267F	Snellman sandy loam, 30 to 45 percent slopes	3,470	0.2
290	Rothsay silt loam	1,179	*
293B	Swenoda fine sandy loam, 1 to 4 percent slopes	1,276	*
335	Urness mucky silt loam	5,181	0.4
339	Fordville loam	8,073	0.6
341A	Arvilla sandy loam, 0 to 2 percent slopes	2,217	0.2
341B	Arvilla sandy loam, 2 to 6 percent slopes	13,905	1.0
371	Clontarf sandy loam	2,552	0.2
375	Forada loam	1,796	0.1
402C	Sioux loamy sand, 2 to 12 percent slopes	700	*
402E	Sioux loamy sand, 12 to 40 percent slopes	782	*
406A	Dorset sandy loam, 0 to 2 percent slopes	6,898	0.5
406B	Dorset sandy loam, 2 to 6 percent slopes	12,887	0.9
418	Lamoure silty clay loam, occasionally flooded	343	*
422B	Bygland silty clay loam, 1 to 6 percent slopes	5,832	0.4
422C	Bygland silty clay loam, 6 to 15 percent slopes	622	*
426	Foldahl loamy fine sand	525	*
441A	Almora loam, 0 to 2 percent slopes	1,704	0.1
441B	Almora loam, 2 to 6 percent slopes	5,181	0.4
441C	Almora loam, 6 to 12 percent slopes	1,332	*

See footnote at end of table.

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
481	Kratka fine sandy loam	635	*
494	Darnen loam, moderately wet	7,616	0.5
497	Hantho silt loam	1,535	0.1
508	Wyndmere fine sandy loam	192	*
540	Seelyeville muck	33,476	2.4
541	Rifle mucky peat	1,345	*
544	Cathro muck	15,960	1.1
567A	Verndale sandy loam, 0 to 2 percent slopes	5,374	0.4
567B	Verndale sandy loam, 2 to 6 percent slopes	562	*
609B	Dickey loamy fine sand, 1 to 5 percent slopes	489	*
624	Rosy sandy loam	17	*
646C	Peever clay loam, 6 to 12 percent slopes	4,001	0.3
646D	Peever clay loam, 12 to 18 percent slopes	1,505	0.1
670	Knute fine sandy loam	864	*
680	Parnell silt loam	8,411	0.6
698	Doran clay loam	1,031	*
701	Runeberg mucky loam, depressional	6,254	0.4
705B	Nitche-Kandota-Lida complex, 1 to 6 percent slopes	11,857	0.8
705C	Nitche-Kandota-Lida complex, 6 to 12 percent slopes	3,121	0.2
707B	Lizzie silt loam, 2 to 6 percent slopes	5,543	0.4
707C2	Lizzie silt loam, 6 to 12 percent slopes, eroded	1,637	0.1
707D2	Lizzie silt loam, 12 to 20 percent slopes, eroded	387	*
710	Friberg-Weetown complex	10,598	0.7
711B	Arvilla-Sandberg complex, 2 to 6 percent slopes	948	*
711C	Arvilla-Sandberg complex, 6 to 12 percent slopes	15,906	1.1
715	Bluffcreek-Clearriver complex	16,484	1.2
716B	Leaflake-Eagleview complex, 1 to 6 percent slopes	5,326	0.4
716C	Leaflake-Eagleview complex, 6 to 12 percent slopes	777	*
716D	Leaflake-Eagleview complex, 12 to 20 percent slopes	300	*
718E	Naytahwaush loam, 15 to 30 percent slopes	4,218	0.3
721B	Corliss loamy sand, 2 to 6 percent slopes	4,290	0.3
721C	Corliss loamy sand, 6 to 12 percent slopes	1,808	0.1
721D	Corliss loamy sand, 12 to 20 percent slopes	4,410	0.3
721E	Corliss loamy sand, 20 to 35 percent slopes	1,826	0.1
726	Kratka sandy loam, thick solum, depressional	1,824	0.1
746	Haslie muck	7,712	0.5
760C2	Chapett-Sisseton complex, 6 to 12 percent slopes, eroded	36,561	2.6
760D2	Chapett-Sisseton complex, 12 to 20 percent slopes, eroded	13,568	1.0
769B	Mehurin clay loam, 1 to 4 percent slopes	1,940	0.1
776B	Snellman-Sugarbush complex, 2 to 8 percent slopes	14	*
776C	Snellman-Sugarbush complex, 8 to 15 percent slopes	218	*
776E	Snellman-Sugarbush complex, 15 to 30 percent slopes	95	*
777C2	Sisseton-Heimdal complex, 6 to 12 percent slopes, eroded	12,508	0.9
777D2	Sisseton-Heimdal complex, 12 to 20 percent slopes, eroded	4,531	0.3
777E	Sisseton-Heimdal complex, 20 to 30 percent slopes	1,257	*
778B	Dorset-Corliss complex, 1 to 6 percent slopes	34,537	2.4
778C	Dorset-Corliss complex, 6 to 12 percent slopes	18,654	1.3
779B	Peever-Mehurin complex, 2 to 6 percent slopes	2,335	0.2
902B	Barnes-Buse complex, 2 to 6 percent slopes	17,599	1.2
903C2	Barnes-Langhei complex, 6 to 12 percent slopes, eroded	16,843	1.2
915C2	Forman-Buse complex, 6 to 12 percent slopes, eroded	15,159	1.1
915D2	Forman-Buse complex, 12 to 20 percent slopes, eroded	5,832	0.4
931C2	Formdale-Langhei complex, 6 to 12 percent slopes, eroded	6,218	0.4
931D2	Formdale-Langhei complex, 12 to 20 percent slopes, eroded	806	*
942D2	Langhei-Barnes complex, 12 to 20 percent slopes, eroded	4,627	0.3
957B2	Rothsay-Zell complex, 2 to 6 percent slopes, eroded	6,025	0.4
969C2	Zell-Rothsay complex, 6 to 12 percent slopes, eroded	7,447	0.5
969D2	Zell-Rothsay complex, 12 to 20 percent slopes, eroded	636	*
1015	Udipsamments (cut and fill land)	952	*
1016	Udorthents, loamy (cut and fill land)	2,699	0.2
1027	Udorthents, wet substratum (fill land)	461	*
1030	Pits, gravel-Udipsamments complex	1,770	0.1

See footnote at end of table.

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
1077	Forada and Leafriver soils, depressional	12,265	0.9
1102B	Chapett-Dorset complex, 1 to 6 percent slopes	1,621	0.1
1102C	Chapett-Dorset complex, 6 to 12 percent slopes, eroded	2,988	0.2
1103	Clitherall sandy loam	1,975	0.1
1104B	Waukon-Dorset complex, 1 to 6 percent slopes	755	*
1104C	Waukon-Dorset complex, 6 to 12 percent slopes, eroded	3,663	0.2
1104D	Waukon-Dorset complex, 12 to 20 percent slopes, eroded	2,193	0.2
1105B	Dent silt loam, 1 to 6 percent slopes	3,880	0.3
1110	Isan sandy loam	1,603	0.1
1111	Nidaros muck, frequently flooded	8,941	0.6
1112D	Chapett-Corliss complex, 12 to 20 percent slopes, eroded	3,133	0.2
1112E	Chapett-Corliss complex, 20 to 30 percent slopes	1,185	*
1113	Haslie, Seelyeville, and Cathro soils, ponded	17,671	1.2
1114	Hangaard loamy sand, lake beaches	758	*
1120	Rushlake-Hangaard complex	3,013	0.2
1129	Lindaas silty clay loam, morainic	865	*
1131B	Verndale-Abbeylake complex, 1 to 6 percent slopes	8,098	0.6
1136	Nidaros muck	19,340	1.4
1149	Hamerly clay loam	1,685	0.1
1195A	Sybil-Eagleview complex, 0 to 2 percent slopes	984	*
1195B	Sybil-Eagleview complex, 2 to 8 percent slopes	9,736	0.7
1195C	Sybil-Eagleview complex, 8 to 15 percent slopes	4,531	0.3
1195E	Sybil-Eagleview complex, 15 to 30 percent slopes	1,492	0.1
1196B	Lida-Two Inlets complex, 1 to 8 percent slopes	19,778	1.4
1196C	Lida-Two Inlets complex, 8 to 15 percent slopes	22,365	1.6
1196E	Lida-Two Inlets complex, 15 to 30 percent slopes	3,273	0.2
1196F	Lida-Two Inlets complex, 30 to 50 percent slopes	604	*
1200	Egglake loam	812	*
1208B	Naytahwaush-Mahkonce complex, 1 to 8 percent slopes	6,555	0.5
1209C	Naytahwaush clay loam, 8 to 15 percent slopes, eroded	8,170	0.6
1212B	Mahkonce clay loam, 1 to 4 percent slopes	1,958	0.1
1214	Mustinka silty clay loam	580	*
1215	Pinelake sandy loam	8,140	0.6
1216B	Egglake-Wykeham complex, 0 to 5 percent slopes	4,655	0.3
1217E	Waukon-Lida complex, 20 to 35 percent slopes	1,238	*
1218B	Snellman-Lida complex, 1 to 8 percent slopes	3,244	0.2
1218C	Snellman-Lida complex, 8 to 15 percent slopes	7,941	0.6
1218E	Snellman-Lida complex, 15 to 30 percent slopes	5,398	0.4
1218F	Snellman-Lida complex, 30 to 45 percent slopes	928	*
1219C	Sandberg-Sverdrup complex, 6 to 12 percent slopes	2,772	0.2
1221B	Sverdrup-Sandberg complex, 2 to 6 percent slopes	2,664	0.2
1223D	Sandberg-Arvilla complex, 12 to 20 percent slopes	4,386	0.3
1227	Quam, Cathro, and Urness soils, ponded	15,492	1.1
1230	Haslie and Nidaros soils, ponded	26,101	1.8
1232B	Chapett loam, 2 to 6 percent slopes	18,027	1.3
1232E	Chapett loam, 20 to 30 percent slopes	1,552	0.1
1234B	Formdale-Buse complex, 2 to 6 percent slopes	20,738	1.4
1237	Lakepark loam	7,037	0.5
1239	Quam silt loam	10,218	0.7
1240	Roliss clay loam	6,170	0.4
1247D	Corliss-Dorset complex, 12 to 20 percent slopes	4,965	0.3
1250C	Abbeylake-Verndale complex, 6 to 12 percent slopes	680	*
1259	Hamerly-Mustinka complex	2,085	0.1
1275B	Kandota-Egglake, depressional, complex, 0 to 8 percent slopes	2,236	0.2
1275C	Kandota-Egglake, depressional, complex, 0 to 15 percent slopes	1,674	0.1
1276	Knute-Brandsvold complex, thick solum	5,736	0.4
1277D	Corliss-Sverdrup complex, 12 to 20 percent slopes	822	*
1289	Knute fine sandy loam, thick solum	5,374	0.4
1290	Brandsvold fine sandy loam, thick solum	4,242	0.3
1291	Sedgeville loam, frequently flooded	1,107	*
1293	Sedgeville fine sandy loam, rarely flooded	744	*
1304A	Glyndon very fine sandy loam	278	*

See footnote at end of table.

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
1307	Rushlake sand	1,854	0.1
1317	Vallers silty clay loam	524	*
1319B	Rockwood sandy loam, 2 to 6 percent slopes, stony	10,484	0.7
1319C	Rockwood sandy loam, 6 to 12 percent slopes, stony	2,069	0.1
1319D	Rockwood sandy loam, 12 to 20 percent slopes, stony	503	*
1320B	Blowers sandy loam, 1 to 5 percent slopes, stony	35,777	2.5
1321	Paddock-Becida complex, stony	23,196	1.6
1322	Wolverton very fine sandy loam	813	*
1324B	Heimdal-Sisseton complex, 2 to 6 percent slopes	8,025	0.6
1338	Oakcreek loam	1,557	0.1
1339	Borup mucky silt loam, depressional	345	*
1340	Bluffcreek-Epoufette complex	2,024	0.1
1341	Clitherall-Wykeham complex	5,061	0.4
1342	Pinelake, loamy substratum-Brandsvold complex	4,025	0.3
1343C	Lida-Almora-Lizzie complex, 8 to 15 percent slopes	1,332	*
1344B	Lida-Almora-Dent complex, 1 to 8 percent slopes	3,374	0.2
1345	Bluffcreek-Rosy complex	748	*
1346	Nidaros muck, calcareous	7,326	0.5
1347B	Kandota loam, 1 to 6 percent slopes	5,097	0.4
1348	Knute loam, thick solum	3,555	0.2
1349	Clotho loam, moderately permeable	300	*
1350	Brandsvold loam, thick solum	868	*
1351	Bluffton loam, moderately permeable	4,643	0.3
1356	Water, miscellaneous	177	*
1365	Hillview fine sandy loam	1,135	*
1396	Sedgeville, Nidaros, and Aquolls soils, channeled	1,757	0.1
1397	Bemidji loamy sand, moderately permeable	698	*
1825B	Seelyeville muck, seep land, 1 to 10 percent slopes	749	*
1874	Radium loamy sand	578	*
1943	Roscommon loamy sand	1,046	*
1975	Oylen sandy loam	11,303	0.8
W	Water	233,212	16.4
	Total	1,423,300	100.0

* Less than 0.1 percent.

Agronomy

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

Planners of management systems for individual fields or farms should consider obtaining specific information from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Crops and Pasture

Clarion J. Neseth, district conservationist, and John A. Schmidt, district conservationist, Natural Resources Conservation Service, helped prepare this section.

Many crops and pasture plants can be grown in Otter Tail County if proper management is applied. The main crops grown are alfalfa hay, corn, edible beans, barley, oats, potatoes, spring wheat, and soybeans. Small acreages of sunflowers, rye, buckwheat, and sugarbeets also are grown. Soil productivity within the county ranges from marginal to high.

The main concerns in managing the cropland in the county are water erosion, soil blowing (fig. 22), droughtiness, wetness, fertility, and water quality. Good management can increase productivity and at the same time conserve the soil.

As topsoil is removed by erosion, nutrients and organic matter are also removed. The eroding sediment settles at the base of slopes or in depressions or may enter streams, rivers, or lakes, where it can adversely affect water quality.

Soil blowing is most common in nearly level, unprotected areas of the Glacial Lake Agassiz basin and on the pitted outwash plains. Unprotected gently sloping to sloping areas on the till plains, stagnation moraines, and drumlin fields may also be susceptible to soil blowing. The soils that are most susceptible to soil blowing are those in wind erodibility groups 4L, 3, 2, and 1, which are described in the “Soil Properties” section.

The hazard of water erosion is most severe in areas of cropland that have gently sloping or moderately steep slopes on the pitted outwash plains, till plains, stagnation moraines, and drumlin fields. The soils most susceptible to water erosion are on long slopes and have the highest K factors and lowest T factors (see “Erosion Factors” elsewhere in this section).

Conserving the topsoil is important because the topsoil acts as a storage site for nutrients and water that are available for use by plants. Conservation practices reduce the hazard of surface runoff of fertilizers and farm chemicals, minimize soil crusting, increase the rate of water infiltration, keep the topsoil in place, and minimize the sedimentation caused by water and by soil blowing. Some common conservation practices that have been applied in the county are including grasses and legumes in the crop rotation; planting on the contour; contour stripcropping (fig. 23); applying a system of conservation tillage, such as no-till or minimum tillage; and establishing grassed waterways, field windbreaks, diversions, and sediment basins.

Cobbles, stones, and boulders that interfered with tillage operations have been removed from much of the cropland in the county. Periodically, rocks will surface because of tillage practices or frost action and must be removed. Wooded areas and pastures that are being converted to cropland are the most likely to have stones and boulders that can interfere with farming. Soils that formed in glacial till can contain cobbles, stones, or boulders that hinder tillage. Soils on the Wadena Drumlin Field are characterized by a large number of cobbles and stones in the soil and on the surface. Also, soils that formed in outwash materials in areas of the Alexandria Moraine Complex or within about a mile of the complex typically have rocks of a variety of sizes that can interfere with tillage. Areas that contain many rock fragments are better suited to permanent pasture, unless the removal of the stones and boulders is feasible.

Most of the soils in the pitted outwash plains are droughty and have been irrigated. Maintaining a cover of crop residue is important during the critical erosion periods of early spring and late fall. Keeping crop residue on the surface minimizes moisture loss by lowering the evaporation rate and increases moisture for spring planting by catching snow in the stubble

Figure 22.—Water erosion and soil blowing are hazards in areas of Dorset-Corliss complex, 6 to 12 percent slopes, and Dorset-Corliss complex, 1 to 6 percent slopes (background). Crop residue management and other conservation practices are needed in areas of these soils.

during the winter. Because of moderately rapid or rapid permeability, these outwash soils have a high potential for the leaching of nutrients into the ground water.

Many potholes and depressions in the county are difficult to drain because of a lack of suitable outlets. Excess surface water can be directed off some fields by shaping waterways and connecting them with natural drainageways or drainage outlets. Some poorly drained and very poorly drained areas may be suited to forage crops or can be used as pasture. Mixtures of reed canarygrass, timothy, alsike clover, or birdsfoot trefoil are most frequently planted. Wild meadow hay is harvested in some of the larger areas.

State and Federal regulations may restrict any changes in the natural drainage condition of a wetland or hydric soil area. Before any alterations are made to a wetland or within a hydric soil area, the landowner should consult with local, State, or Federal agencies, such as the Natural Resources Conservation Service, the U.S. Fish and Wildlife Service, the Minnesota Department of Natural Resources, the Land and Resource Office of Otter Tail County, or the local Soil and Water Conservation District.

Pastures in the county are generally in areas of poorly drained or very poorly drained soils, on the more sloping land, in areas with excessive stones or boulders, or on marginally productive soils. Pastures can be improved with proper management. Some general management practices, such as maintaining proper nutrient levels, using suitable forage plants, and using a system of rotation grazing, encourage forage growth. The use of wet pastures should be deferred until the sod is firm, the forage has reached a minimum height, and the plants are growing vigorously. Overgrazing reduces the quality of forage and the ability of the plants to recover after grazing. Improvement of pastures in some areas may be difficult because of excessive wetness or the large number of stones or boulders on the surface.

Nutrient levels of the soils in the county are extremely variable. Current fertility levels, recommended nutrient levels, and soil pH are determined by soil testing. Soil testing can be done by private agricultural consultants or with the help of the

County extension offices and the University of Minnesota. Past fertility practices and cropping history can influence the current fertility status of the soil. The kinds and amounts of fertilizer needed depend on the soil properties, the crop to be planted, the level of management, and the desired yields. Some crop yields could be increased by supplying needed micronutrients, such as iron, magnesium, boron, sulfur, or zinc (USDA/NRCS and Minnesota Agricultural Extension Service, 1990).

Soil texture, permeability, organic matter content, drainage, and soil reaction are properties that can affect the type, amounts, or method of application of fertilizers and pesticides. Recommended amounts of fertilizer should be used, and the instructions on pesticide labels should be followed. The potential for leaching fertilizers or agricultural chemicals into ground water exists in areas of soils that formed in outwash materials and that are moderately rapidly permeable or rapidly permeable. Applying recommended amounts of fertilizers and chemicals in a timely manner helps to achieve the optimum results and can minimize the potential for leaching (Durgan and others, 1995). Split applications of fertilizers enable the plants to utilize the nutrients effectively and can minimize leaching. Variable rate application technology based on soil topography and Geographic Positioning Systems (GPS) can maximize the use of the information provided by the soil maps.

The root zone of the soils in Otter Tail County generally has pH ranging from 5.0 to 7.8. The availability of nutrients to plants and the peak effectiveness of agricultural chemicals are influenced by the soil pH. Soil reaction with a pH near neutral is optimum. Most of the outwash soils and the soils that formed under forest vegetation are typically leached and are acid in the surface soil and subsoil. Periodic applications of lime as recommended by soil tests enhance the availability of plant nutrients. Some soils, such as Hamerly soils, have a high pH in the surface soil. Thus, nutrients are less available to plants and a nutrient deficiency may result. Applying additional fertilizers may be necessary to compensate for the nutrient deficiency. Also, some crops or windbreak

Figure 23.—Contour stripcropping in an area of Rockwood sandy loam, 2 to 6 percent slopes, stony.

species do not grow well in soils that have a high pH. Species that are tolerant of a high pH should be planted in areas of these soils.

Irrigation

Otter Tail County has about 45,000 acres under irrigation. This number represents the largest acreage of irrigated land in Minnesota. Approximately 300 irrigation systems are operating in the county. The majority of the irrigation systems are center-pivot, and a few traveling gun irrigation systems are also used. The major irrigated crops grown are potatoes, corn, soybeans, edible beans, and alfalfa hay. At present, yields of irrigated corn are typically 150 to 160 bushels per acre on a variety of soil types.

The largest irrigated areas are in the Hubbard-Duelm-Nidaros, Dorset-Corliss-Nidaros, and Arvilla-Sverdrup-Sandberg associations, which are described under the heading “General Soil Map Units” in Part I of this survey.

Annual precipitation in Otter Tail County ranges from 20 to 24 inches. About three-fourths of the precipitation falls from May to September; the growing season for most crops falls within this period.

An adequate supply of available water is needed for irrigation. Most of the ground-water aquifers in Otter Tail County are in the surficial deposits of sands and gravels. These aquifers are recharged annually by snowmelt and rainfall. Most of the irrigation systems in Otter Tail County use water from ground-water aquifers. A few systems use water from rivers or lakes.

Soil properties that can affect irrigation include available water capacity, the water intake rate, and the slope.

Soils that formed in glacial till, such as Barnes, Forman, Waukon, and Kandota soils, have a moderate or high available water capacity and typically can store from 9 to 12 inches of available water in the upper 60 inches of the soil profile. These soils have a sufficient water-holding capacity for achieving high yields in most years without irrigation.

Soils that formed in glacial outwash, such as Arvilla, Sverdrup, Dorset, Verndale, Lida, and Sybil soils, have a low or moderate available water capacity and typically can store from 2 to 4 inches of available water in the upper 18 to 24 inches of the soil profile. These soils typically have 1 to 2 feet of loamy sediments overlying sand or gravel. They have good potential for irrigation.

Other glacial outwash soils, such as Corliss, Hubbard, Sandberg, and Two Inlets soils, have a very low or low available water capacity and typically store less than 3 inches of available water in the upper 60 inches of the soil profile. These soils typically are coarse textured throughout. They are not well suited to irrigation because of rapid percolation rates and a poor ability to store water.

Typically, water storage in the upper 24 inches is considered when irrigation is planned for areas of outwash soils. The available water capacity below a depth of 24 inches is generally so low that it is not a consideration.

The intake rate is a measure of the soil’s capacity to absorb water and to move water through the soil profile. The infiltration rate is the rate at which water enters the surface layer of the soil. Percolation is the rate at which water moves through the soil. The soil layer having the lowest transmission rate, either at the surface or below the surface, determines how fast water will move through the soil profile. Sealing or crusting of the soil surface may reduce the intake rate and increase the rate of water runoff. Leaving crop residue on the surface helps to prevent crusting, enhances the absorption of water, and reduces the potential for erosion.

The slope is an important consideration affecting irrigation because high yields of irrigated crops cannot be maintained on eroding land. Erosion-control measures are needed if sloping areas are irrigated. The rate at which water is applied and the ability of the soil to absorb the water are factors that affect water erosion and should be considered when the irrigation system is designed and utilized.

Soil types can influence the amount and type of management needed to achieve yield goals. Each crop has a certain rooting depth that governs how much water can be used from the soil. Because most roots are in the upper part of the root zone, applications of irrigation water are generally managed to a depth somewhat less than the total root depth.

A variety of water management systems are available to determine the amount of water to be applied. Most systems take into account the plant’s demand for water at various stages of development and the amount of water currently in the soil in relation to rooting depth. Some systems utilize computer programs in combination with field sampling of soil moisture.

Many farmers and homeowners in these areas of irrigated cropland get their drinking water from the same aquifer as the irrigation water. If not properly managed, these aquifers are susceptible to contamination from manure, fertilizer, and certain pesticides. Chemicals and nutrients have the potential to move downward in the soil profile and eventually into the ground water. Proper and timely applications of chemicals and fertilizers can help to prevent the leaching of excess chemicals and nutrients or the

transportation of these substances in runoff water. Also, applying proper amounts of irrigation water reduces the runoff rate and the likelihood that nutrients will be flushed below the rooting zone.

Cropland Management Considerations

The management concerns affecting the use of the detailed soil map units in the survey area for crops are shown in the table "Cropland Management Considerations." The main concerns in managing nonirrigated cropland are conserving moisture, controlling soil blowing and water erosion, and maintaining soil fertility.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the rate of water infiltration. 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 *soil blowing* and *water erosion*. Conservation tillage, stripcropping, field windbreaks, contour farming, conservation cropping systems, crop residue management, terraces, diversions, and grassed waterways 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 are as follows:

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 to 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 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 create drainage problems, raise the water table, and increase 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.

Excessive permeability.—Permeability is 6 inches per hour or more within the soil profile.

Flooding.—Flooding is occasional or frequent.

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

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

Ponding.—Ponding duration is assigned to the map unit component. The water table 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).—Depth to the water table is 4 feet or less, the permeability of any layer is more than 6.0 inches per hour, or the depth to bedrock is less than 60 inches.

Potential for surface-water contamination (by nutrients or pesticides).—The map unit component is occasionally flooded or 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.

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

Restricted permeability.—Permeability is less than 0.06 inch per hour 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.

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

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 map unit name or in the description of the surface layer.

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.

Water table.—A water table is within 2.5 feet of the surface.

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

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 the table “Land Capability and Yields per Acre of Crops and Pasture.” 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 map units in the survey area 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 the table 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.

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.

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 and Yields per Acre of Crops and Pasture.”

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 can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

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 map units in the survey area is given in the table “Land Capability and Yields per Acre of Crops and Pasture” at the end of this section.

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 364,664 acres, or nearly 26 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 the table "Prime Farmland" at the end of this section. 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 "Soil Series and Detailed Soil Map Units" in Part I of this survey.

Erosion Factors

Soil erodibility (K) and soil-loss tolerance (T) factors are used in an equation that predicts the amount of soil lost through water erosion in areas of cropland. The procedure for predicting soil loss is useful in guiding the selection of soil and water conservation practices. The erosion factors for the soils in the survey area are listed in the table "Physical Properties of the Soils."

Soil Erodibility (K) Factor

The soil erodibility (K) factor indicates the susceptibility of a soil to sheet and rill erosion by water. The soil properties that influence erodibility are those that affect the infiltration rate, the movement of water through the soil, and the water storage capacity of the soil and those that allow the soil to resist dispersion, splashing, abrasion, and the transporting forces of rainfall and runoff. The most important soil properties are the content of silt plus very fine sand, the content of sand coarser than very fine sand, the content of organic matter, soil structure, and permeability.

Fragment-Free Soil Erodibility (Kf) Factor

This is one of the factors used in the revised Universal Soil Loss Equation. It shows the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Soil-Loss Tolerance (T) Factor

The soil-loss tolerance (T) factor is an estimate of the maximum annual rate of soil erosion that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons of soil loss per acre per year. Ratings of 1 to 5 are used, depending on soil properties and prior erosion. The criteria used in assigning a T factor to a soil include maintenance of an adequate rooting depth for crop production, potential reduction of crop yields, maintenance of water-control structures affected by sedimentation, prevention of gullying, and the value of nutrients lost through erosion.

Wind Erodibility Groups

Wind erodibility is directly related to the percentage of dry, nonerodible surface soil aggregates larger than 0.84 millimeter in diameter. From this percentage, the wind erodibility index (I) factor is determined. This factor is an expression of the stability of the soil aggregates, or the extent to which they are broken down by tillage and the abrasion caused by windblown soil particles. Soils are assigned to wind erodibility groups (WEG) having similar percentages of dry soil aggregates larger than 0.84 millimeter. The wind erodibility groups and wind erodibility index numbers are listed in the table "Physical Properties of the Soils."

Additional information about wind erodibility groups and K, Kf, T, and I factors can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection (fig. 24).

Figure 24.—Windbreaks and shelterbelts minimize the effects of soil blowing in this area of Hubbard loamy sand, 0 to 2 percent slopes.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Windbreaks are often planted on land that did not originally support trees. Knowledge of how trees perform on such land can be gained only by observing and recording the performance of trees that have been planted and have survived. Many popular windbreak species are not indigenous to the areas in which they are planted.

Each tree or shrub species has certain climatic and physiographic limits. Within these parameters, a tree or shrub may grow well or grow poorly, depending on the characteristics of the soil. Each tree or shrub has definable potential heights in a given physiographic area and under a given climate. Accurate definitions of potential heights are necessary when a windbreak is planned and designed.

The table “Windbreaks and Environmental Plantings” shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in this table are based on

measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service or from a nursery.

Windbreak Suitability Groups

Windbreak suitability groups consist of soils in which the kinds and degrees of the hazards and limitations that affect the survival and growth of trees and shrubs in windbreaks are about the same.

The windbreak suitability group for each soil in the survey area is listed in the table “Windbreak Suitability Groups” at the end of this section. The following paragraphs explain the characteristics of the soils in each group.

Group 1 consists of soils that are somewhat poorly drained or moderately well drained, are rapidly permeable to moderately slowly permeable, and do not have free carbonates in the upper 20 inches.

Group 1K consists of soils that are somewhat poorly drained or moderately well drained, are rapidly permeable to moderately slowly permeable, and have free carbonates within 20 inches of the surface. These soils may be very slightly saline or slightly saline (the electrical conductivity is 2 to 8).

Group 2 consists of poorly drained soils that have been artificially drained and do not have free carbonates in the upper 20 inches. Permeability varies.

Group 2K consists of poorly drained or very poorly drained soils that have been artificially drained and have free carbonates within 20 inches of the surface. Permeability varies. These soils may be very slightly saline or slightly saline (the electrical conductivity is 2 to 8).

Group 2H consists of very poorly drained soils that have been artificially drained and have more than 16 inches of organic material. Permeability varies.

Group 2W consists of very poorly drained soils that are subject to ponding and have been artificially drained. It includes soils that have an organic surface layer up to 16 inches thick. Permeability varies.

Group 3 consists of soils that are well drained or moderately well drained and are loamy or silty throughout. Permeability is moderate or moderately slow. These soils do not have free carbonates in the upper 20 inches.

Group 4 consists of soils that are well drained, moderately well drained, or somewhat poorly drained and have a silty or loamy surface layer and a clayey subsoil. Permeability is slow or very slow.

Group 4C consists of soils that are well drained, moderately well drained, or somewhat poorly drained and have a clayey surface layer and subsoil. Permeability is slow or very slow.

Group 4F consists of soils that are well drained, moderately well drained, or somewhat poorly drained and have a substratum of dense till. Permeability is slow or very slow.

Group 5 consists of soils that are excessively drained to moderately well drained and have a moderate available water capacity. These soils are dominantly fine sandy loam or sandy loam, but some are sandy in the upper part and loamy in the lower part.

Group 6G consists of excessively drained to moderately well drained soils that are loamy in the upper part and have sand or sand and gravel at a depth of 20 to 40 inches. These soils have a low or moderate available water capacity.

Group 6D consists of excessively drained to moderately well drained, loamy soils that have bedrock at a depth of 20 to 40 inches. These soils have a low or moderate available water capacity.

Group 7 consists of excessively drained to well drained soils that are dominantly loamy fine sand or coarser textured and are shallow to sand or to sand and gravel. These soils have a low available water capacity.

Group 8 consists of excessively drained to well drained, loamy soils that have free carbonates within 20 inches of the surface.

Group 9W consists of soils that are somewhat poorly drained, poorly drained, or very poorly drained and are moderately saline (the electrical conductivity is 8 to 16).

Group 10 consists of soils or miscellaneous land types that generally are not suitable for windbreaks. One or more characteristics, such as soil depth, texture, wetness, available water capacity, or slope, limit the planting, survival, or growth of trees and shrubs.

Cropland Management Considerations

(See text for a description of the considerations listed in this table)

Map symbol and soil name	Cropland management considerations
7A, 7B:	
Hubbard	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
7C:	
Hubbard	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
26:	
Aazdahl	Potential for ground-water contamination Potential poor tilth and compaction
34:	
Parnell	Ponding Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table
38B:	
Waukon	Potential for surface-water contamination Water erosion
38C2:	
Waukon	Potential for surface-water contamination Previously eroded Water erosion
38D2:	
Waukon	Potential for surface-water contamination Previously eroded Slope Water erosion
38E:	
Waukon	Potential for surface-water contamination Slope Water erosion
46:	
Borup	Lime content Potential for ground-water contamination Water table Wind erosion
53B, 53C:	
Kandota	Potential for surface-water contamination Water erosion Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
53D:	
Kandota	Potential for surface-water contamination Slope Water erosion Wind erosion
58:	
Kittson	Potential for ground-water contamination Potential for surface-water contamination
59:	
Grimstad	Excessive permeability Lime content Potential for ground-water contamination Wind erosion
61:	
Arveson	Lime content Potential for ground-water contamination Water table Wind erosion
63:	
Rockwell	Excessive permeability Lime content Potential for ground-water contamination Water table Wind erosion
65:	
Foxhome	Excessive permeability Potential for ground-water contamination Wind erosion
66:	
Flaming	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
68:	
Arveson	Lime content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
107:	
Winger	Lime content Potential for ground-water contamination Water table Wind erosion
108:	
McIntosh	Lime content Potential for ground-water contamination Wind erosion
121:	
Wykeham	Potential for ground-water contamination Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
127A:	
Sverdrup	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
127B, 127C:	
Sverdrup	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
141B, 141C:	
Egeland	Potential for surface-water contamination Water erosion Wind erosion
141D:	
Egeland	Potential for surface-water contamination Slope Water erosion Wind erosion
168B:	
Forman	Potential for surface-water contamination Potential poor tilth and compaction Water erosion
180:	
Gonvick	Potential for ground-water contamination
184:	
Hamerly	Lime content Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
187:	
Haug	High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
191:	
Epoufette	Excessive permeability Limited available water capacity Potential for ground-water contamination Water table Wind erosion
202:	
Meehan	Excessive permeability Limited available water capacity Potential for ground-water contamination Water table Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
258A, 258B:	
Sandberg	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
258C:	
Sandberg	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
260:	
Duelm	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
267B, 267C:	
Snellman	Potential for surface-water contamination Water erosion Wind erosion
267E, 267F:	
Snellman	Potential for surface-water contamination Slope Water erosion Wind erosion
290:	
Rothsay	No major limitations or hazards
293B:	
Swenoda	Potential for ground-water contamination Water erosion Wind erosion
335:	
Urness	High organic matter content Lime content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
339:	
Fordville	Excessive permeability Potential for ground-water contamination
341A:	
Arvilla	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
341B:	
Arvilla	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
371:	
Clontarf	Excessive permeability Potential for ground-water contamination Wind erosion
375:	
Forada	Excessive permeability Potential for ground-water contamination Water table
402C:	
Sioux	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
402E:	
Sioux	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
406A:	
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
406B:	
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
418:	
Lamoure	Flooding Lime content Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
422B, 422C:	
Bygland	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water erosion
426:	
Foldahl	Excessive permeability Potential for ground-water contamination Wind erosion
441A:	
Almora	Excessive permeability Potential for ground-water contamination
441B, 441C:	
Almora	Excessive permeability Potential for ground-water contamination Potential for surface-water contamination Water erosion
481:	
Kratka	Excessive permeability Potential for ground-water contamination Water table Wind erosion
494:	
Darnen	Potential for ground-water contamination
497:	
Hantho	Potential for ground-water contamination
508:	
Wyndmere	Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
540:	
Seelyeville	High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
541:	
Rifle	High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
544:	
Cathro	High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
567A:	
Verndale	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
567B:	
Verndale	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
609B:	
Dickey	Excessive permeability Potential for ground-water contamination Potential for surface-water contamination Wind erosion
624:	
Rosy	Limited organic matter content Potential for ground-water contamination Wind erosion
646C:	
Peever	Potential for surface-water contamination Potential poor tilth and compaction Water erosion
646D:	
Peever	Potential for surface-water contamination Potential poor tilth and compaction Slope Water erosion
670:	
Knute	Potential for ground-water contamination Wind erosion
680:	
Parnell	Potential for ground-water contamination Water table
698:	
Doran	Potential for ground-water contamination Potential poor tilth and compaction
701:	
Runeberg	Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
705B:	
Nitche	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
705B:	
Kandota	Potential for surface-water contamination Water erosion Wind erosion
Lida	Excessive permeability Limited available water capacity Potential for ground-water contamination Water erosion Wind erosion
705C:	
Nitche	Excessive permeability Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Kandota	Potential for surface-water contamination Water erosion Wind erosion
Lida	Excessive permeability Limited available water capacity Potential for ground-water contamination Water erosion Wind erosion
707B:	
Lizzie	Potential for surface-water contamination Water erosion
707C2:	
Lizzie	Potential for surface-water contamination Previously eroded Water erosion
707D2:	
Lizzie	Potential for surface-water contamination Previously eroded Slope Water erosion
710:	
Friberg	Potential for ground-water contamination Water table
Weetown	Potential for ground-water contamination Wind erosion
711B:	
Arvilla	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Sandberg	Excessive permeability Limited available water capacity Potential for ground-water contamination Water erosion Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
711C:	
Arvilla	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Sandberg	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
715:	
Bluffcreek	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
Clearriver	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Wind erosion
716B:	
Leaflake	Excessive permeability Potential for ground-water contamination Potential for surface-water contamination Wind erosion
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Wind erosion
716C:	
Leaflake	Excessive permeability Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
716D:	
Leaflake	Excessive permeability Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
716D:	
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
718E:	
Naytahwaush	Potential for surface-water contamination Slope Water erosion
721B:	
Corliss	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
721C:	
Corliss	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
721D, 721E:	
Corliss	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
726:	
Kratka	Excessive permeability Ponding Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
746:	
Haslie	High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
760C2:	
Chapett	Potential for surface-water contamination Previously eroded Water erosion
Sisseton	Lime content Potential for surface-water contamination Previously eroded Water erosion Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
760D2:	
Chapett	Potential for surface-water contamination Previously eroded Slope Water erosion
Sisseton	Lime content Potential for surface-water contamination Previously eroded Slope Water erosion Wind erosion
769B:	
Mehurin	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water erosion
776B, 776C:	
Snellman	Potential for surface-water contamination Water erosion Wind erosion
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
776E:	
Snellman	Potential for surface-water contamination Slope Water erosion Wind erosion
Sugarbush	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
777C2:	
Sisseton	Lime content Potential for surface-water contamination Previously eroded Water erosion Wind erosion
Heimdal	Potential for surface-water contamination Previously eroded Water erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
777D2:	
Sisseton	Lime content Potential for surface-water contamination Previously eroded Slope Water erosion Wind erosion
Heimdal	Potential for surface-water contamination Previously eroded Slope Water erosion
777E:	
Sisseton	Lime content Potential for surface-water contamination Slope Water erosion Wind erosion
Heimdal	Potential for surface-water contamination Slope Water erosion
778B:	
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Corliss	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
778C:	
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Corliss	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
779B:	
Peever	Potential for surface-water contamination Potential poor tilth and compaction Water erosion
Mehurin	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
902B:	
Barnes	Potential for surface-water contamination Water erosion
Buse	Lime content Potential for surface-water contamination Water erosion Wind erosion
903C2:	
Barnes	Potential for surface-water contamination Previously eroded Water erosion
Langhei	Lime content Potential for surface-water contamination Previously eroded Water erosion Wind erosion
915C2:	
Forman	Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
Buse	Lime content Potential for surface-water contamination Previously eroded Water erosion Wind erosion
915D2:	
Forman	Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Slope Water erosion
Buse	Lime content Potential for surface-water contamination Previously eroded Slope Water erosion Wind erosion
931C2:	
Formdale	Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
Langhei	Lime content Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
931D2:	
Formdale	Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Slope Water erosion
Langhei	Lime content Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Slope Water erosion Wind erosion
942D2:	
Langhei	Lime content Potential for surface-water contamination Previously eroded Slope Water erosion Wind erosion
Barnes	Potential for surface-water contamination Previously eroded Slope Water erosion
957B2:	
Rothsay	Potential for surface-water contamination Previously eroded Water erosion
Zell	Lime content Potential for surface-water contamination Previously eroded Water erosion Wind erosion
969C2:	
Zell	Lime content Potential for surface-water contamination Previously eroded Water erosion Wind erosion
Rothsay	Potential for surface-water contamination Previously eroded Water erosion
969D2:	
Zell	Lime content Potential for surface-water contamination Previously eroded Slope Water erosion Wind erosion
Rothsay	Potential for surface-water contamination Previously eroded Slope Water erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1015:	
Udipsamments	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Wind erosion
1016:	
Udorthents	Limited available water capacity Slope Water erosion Wind erosion
1027:	
Udorthents	Potential for ground-water contamination
1030:	
Pits	Nonsoil material
Udipsamments	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Wind erosion
1077:	
Forada	Excessive permeability Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
Leafriver	Excessive permeability High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
1102B:	
Chapett	Potential for surface-water contamination Water erosion
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
1102C:	
Chapett	Potential for surface-water contamination Previously eroded Water erosion
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1103:	
Clitherall	Excessive permeability Potential for ground-water contamination Wind erosion
1104B:	
Waukon	Potential for surface-water contamination Water erosion
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
1104C:	
Waukon	Potential for surface-water contamination Previously eroded Water erosion
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion Wind erosion
1104D:	
Waukon	Potential for surface-water contamination Previously eroded Slope Water erosion
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Previously eroded Slope Water erosion Wind erosion
1105B:	
Dent	Potential for ground-water contamination Potential for surface-water contamination Water erosion
1110:	
Isan	Excessive permeability Limited available water capacity Potential for ground-water contamination Water table Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1111:	
Nidaros	Excessive permeability Flooding High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
1112D:	
Chapett	Potential for surface-water contamination Previously eroded Slope Water erosion
Corliss	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Previously eroded Slope Water erosion Wind erosion
1112E:	
Chapett	Potential for surface-water contamination Slope Water erosion
Corliss	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
1113:	
Haslie	High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
Seelyeville	High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
Cathro	High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
1114:	
Hangaard	Excessive permeability Limited available water capacity Potential for ground-water contamination Water table Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1120:	
Rushlake	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
Hangaard	Excessive permeability Limited available water capacity Potential for ground-water contamination Water table Wind erosion
1129:	
Lindaas	Potential for ground-water contamination Potential poor tilth and compaction Water table
1131B:	
Verndale	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Abbeylake	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
1136:	
Nidaros	Excessive permeability High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
1149:	
Hamerly	Lime content Potential for ground-water contamination Potential poor tilth and compaction Water table Wind erosion
1195A:	
Sybil	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Wind erosion
1195B:	
Sybil	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1195B:	
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
1195C:	
Sybil	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
1195E:	
Sybil	Excessive permeability Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
Eagleview	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
1196B, 1196C:	
Lida	Excessive permeability Limited available water capacity Potential for ground-water contamination Water erosion Wind erosion
Two Inlets	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1196E, 1196F:	
Lida	Excessive permeability Limited available water capacity Potential for ground-water contamination Slope Water erosion Wind erosion
Two Inlets	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
1200:	
Egglake	Potential for ground-water contamination Water table
1208B:	
Naytahwaush	Potential for surface-water contamination Potential poor tilth and compaction Water erosion
Mahkonce	Potential for ground-water contamination Potential for surface-water contamination Water erosion
1209C:	
Naytahwaush	Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
1212B:	
Mahkonce	Potential for ground-water contamination Potential for surface-water contamination Water erosion
1214:	
Mustinka	Potential for ground-water contamination Potential poor tilth and compaction Water table
1215:	
Pinelake	Excessive permeability Limited available water capacity Potential for ground-water contamination Water table Wind erosion
1216B:	
Egglake	Potential for ground-water contamination Water table Wind erosion
Wykeham	Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1217E:	
Waukon	Potential for surface-water contamination Slope Water erosion
Lida	Excessive permeability Limited available water capacity Potential for ground-water contamination Slope Water erosion Wind erosion
1218B, 1218C:	
Snellman	Potential for surface-water contamination Water erosion Wind erosion
Lida	Excessive permeability Limited available water capacity Potential for ground-water contamination Water erosion Wind erosion
1218E, 1218F:	
Snellman	Potential for surface-water contamination Slope Water erosion Wind erosion
Lida	Excessive permeability Limited available water capacity Potential for ground-water contamination Slope Water erosion Wind erosion
1219C:	
Sandberg	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Sverdrup	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
1221B:	
Sverdrup	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Sandberg	Excessive permeability Limited available water capacity Potential for ground-water contamination Water erosion Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1223D:	
Sandberg	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
Arvilla	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
1227:	
Quam	Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
Cathro	High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
Urness	High organic matter content Lime content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
1230:	
Haslie	High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
Nidaros	Excessive permeability High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
1232B:	
Chapett	Potential for surface-water contamination Water erosion
1232E:	
Chapett	Potential for surface-water contamination Slope Water erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1234B:	
Formdale	Potential for surface-water contamination Potential poor tilth and compaction Water erosion
Buse	Lime content Potential for surface-water contamination Potential poor tilth and compaction Water erosion Wind erosion
1237:	
Lakepark	Potential for ground-water contamination Water table
1239:	
Quam	Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
1240:	
Roliss	Lime content Potential for ground-water contamination Potential poor tilth and compaction Water table Wind erosion
1247D:	
Corliss	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
Dorset	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
1250C:	
Abbeylake	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Verndale	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1259:	
Hamerly	Lime content Potential for ground-water contamination Potential poor tilth and compaction Water table Wind erosion
Mustinka	Potential for ground-water contamination Potential poor tilth and compaction Water table
1275B, 1275C:	
Kandota	Potential for surface-water contamination Water erosion Wind erosion
Egglake	Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
1276:	
Knute	Potential for ground-water contamination Wind erosion
Brandsvold	Potential for ground-water contamination Water table Wind erosion
1277D:	
Corliss	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
Sverdrup	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
1289:	
Knute	Potential for ground-water contamination Wind erosion
1290:	
Brandsvold	Potential for ground-water contamination Water table Wind erosion
1291:	
Sedgeville	Excessive permeability Flooding Ponding Potential for ground-water contamination Potential for surface-water contamination Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1293:	
Sedgeville	Excessive permeability Potential for ground-water contamination Water table
1304A:	
Glyndon	Lime content Potential for ground-water contamination Water table Wind erosion
1307:	
Rushlake	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
1317:	
Vallers	Lime content Potential for ground-water contamination Potential poor tilth and compaction Water table Wind erosion
1319B:	
Rockwood	Dense layer Potential for surface-water contamination Restricted permeability Surface stones Water erosion Wind erosion
1319C:	
Rockwood	Dense layer Limited available water capacity Potential for surface-water contamination Restricted permeability Surface stones Water erosion Wind erosion
1319D:	
Rockwood	Dense layer Potential for surface-water contamination Restricted permeability Slope Surface stones Water erosion Wind erosion
1320B:	
Blowers	Dense layer Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Surface stones Water erosion Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1321:	
Paddock	Dense layer Potential for ground-water contamination Restricted permeability Surface stones Water table Wind erosion
Becida	Dense layer Limited available water capacity Potential for ground-water contamination Restricted permeability Surface stones Water table
1322:	
Wolverton	Lime content Potential for ground-water contamination Wind erosion
1324B:	
Heimdal	Potential for surface-water contamination Water erosion
Sisseton	Lime content Potential for surface-water contamination Water erosion Wind erosion
1338:	
Oakcreek	Excessive permeability Potential for ground-water contamination
1339:	
Borup	Lime content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
1340:	
Bluffcreek	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
Epoufette	Excessive permeability Limited available water capacity Potential for ground-water contamination Water table Wind erosion
1341:	
Clitherall	Excessive permeability Potential for ground-water contamination Wind erosion
Wykeham	Potential for ground-water contamination Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1342:	
Pinelake	Excessive permeability Potential for ground-water contamination Water table Wind erosion
Brandsvold	Potential for ground-water contamination Water table Wind erosion
1343C:	
Lida	Excessive permeability Limited available water capacity Potential for ground-water contamination Water erosion Wind erosion
Almora	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Lizzie	Potential for surface-water contamination Water erosion Wind erosion
1344B:	
Lida	Excessive permeability Limited available water capacity Potential for ground-water contamination Water erosion Wind erosion
Almora	Excessive permeability Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
Dent	Potential for ground-water contamination Potential for surface-water contamination Water erosion Wind erosion
1345:	
Bluffcreek	Excessive permeability Potential for ground-water contamination Wind erosion
Rosy	Limited organic matter content Potential for ground-water contamination Wind erosion
1346:	
Nidaros	Excessive permeability High organic matter content Lime content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1347B:	
Kandota	Potential for surface-water contamination Water erosion
1348:	
Knute	Potential for ground-water contamination
1349:	
Clotho	Lime content Potential for ground-water contamination Water table Wind erosion
1350:	
Brandsvold	Potential for ground-water contamination Water table
1351:	
Bluffton	Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
1365:	
Hillview	Potential for ground-water contamination Water table Wind erosion
1396:	
Sedgeville	Channeled Excessive permeability Flooding Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
Nidaros	Channeled Excessive permeability High organic matter content Ponding Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
Aquolls	Channeled Ponding Potential for ground-water contamination Potential for surface-water contamination Water table Wind erosion
1397:	
Bemidji	Excessive permeability Potential for ground-water contamination Wind erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1825B:	
Seelyeville	High organic matter content Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
1874:	
Radium	Excessive permeability Limited available water capacity Potential for ground-water contamination Wind erosion
1943:	
Roscommon	Excessive permeability Limited available water capacity Potential for ground-water contamination Water table Wind erosion
1975:	
Oylen	Excessive permeability Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Wind erosion

Land Capability and Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. They are for nonirrigated areas. Absence of an entry indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
7A---------- Hubbard	4s	3.0	55	12.0	1.5	21	24	48
7B---------- Hubbard	4s	2.5	45	11.0	1.5	17	20	39
7C---------- Hubbard	6s	1.5	35	10.0	1.0	13	15	30
26---------- Aazdahl	1	5.7	130	17.0	3.0	45	50	85
34---------- Parnell	3w	5.2	90	15.0	3.5	31	35	59
38B---------- Waukon	2e	5.6	115	16.0	3.0	40	45	75
38C2---------- Waukon	3e	5.5	100	15.0	2.8	35	39	65
38D2---------- Waukon	4e	4.2	75	14.0	2.0	26	29	49
38E---------- Waukon	7e	2.0	---	---	1.5	---	---	---
46---------- Borup	2w	4.5	85	14.0	4.0	29	33	56
53B---------- Kandota	2e	5.5	95	15.0	3.0	35	39	75
53C---------- Kandota	3e	4.5	80	14.0	2.8	29	33	63
53D---------- Kandota	4e	4.0	70	13.0	2.0	25	29	55
58---------- Kittson	1	5.7	120	17.0	3.3	42	45	78

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
59---------- Grimstad	2s	5.0	85	14.0	3.0	29	33	56
61---------- Arveson	3w	4.0	85	14.0	3.8	28	33	66
63---------- Rockwell	2w	5.2	90	15.0	3.8	31	35	59
65---------- Foxhome	3s	4.5	80	14.0	3.0	28	31	52
66---------- Flaming	4s	3.5	60	13.0	2.0	23	26	53
68---------- Arveson	6w	---	---	---	3.5	---	---	---
107---------- Winger	2w	5.5	105	16.0	3.8	36	40	69
108---------- McIntosh	2s	5.6	110	16.0	3.3	38	42	72
121---------- Wykeham	1	5.5	95	15.0	3.3	35	39	75
127A---------- Sverdrup	3s	4.0	70	13.0	2.0	26	31	61
127B---------- Sverdrup	3e	3.5	65	13.0	2.0	24	29	57
127C---------- Sverdrup	4e	3.0	50	12.0	1.5	19	22	44
141B---------- Egeland	3e	4.5	80	14.0	2.0	30	35	70
141C---------- Egeland	4e	4.0	70	13.0	1.8	26	31	61
141D---------- Egeland	6e	3.0	55	12.0	1.5	21	21	48

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
168B---------- Forman	2e	5.6	115	16.0	3.0	40	45	75
180---------- Gonvick	1	5.7	120	17.0	3.3	42	46	78
184---------- Hamerly	2s	5.6	110	16.0	3.3	38	42	72
187---------- Haug	3w	---	---	---	3.5	---	---	---
191---------- Epoufette	4w	3.0	65	13.0	3.8	24	29	57
202---------- Meehan	4w	3.0	60	13.0	2.5	20	25	50
258A---------- Sandberg	4s	3.0	55	12.0	1.5	21	24	48
258B---------- Sandberg	4s	2.5	45	11.0	1.5	17	20	39
258C---------- Sandberg	6s	1.5	35	10.0	1.0	13	15	30
260---------- Duelm	4s	3.0	60	13.0	2.0	23	25	50
267B---------- Snellman	2e	5.2	90	15.0	3.0	33	37	71
267C---------- Snellman	3e	4.2	75	14.0	2.8	27	31	59
267E---------- Snellman	6e	3.0	50	11.0	1.5	---	21	40
267F---------- Snellman	7e	---	---	---	1.0	---	---	---
290---------- Rothsay	2e	5.6	115	16.0	3.0	40	45	75

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
293B---------- Swenoda	2e	5.5	95	15.0	3.0	33	37	62
335---------- Urness	3w	4.2	75	14.0	3.5	22	29	49
339---------- Fordville	2s	4.2	75	14.0	2.8	28	33	66
341A---------- Arvilla	3s	4.0	70	13.0	2.0	26	31	61
341B---------- Arvilla	4s	3.5	65	13.0	2.0	24	29	57
371---------- Clontarf	3s	4.5	80	14.0	2.8	30	35	70
375---------- Forada	2w	3.5	75	14.0	3.8	28	33	66
402C---------- Sioux	6s	1.0	25	8.0	1.0	9	11	20
402E---------- Sioux	7s	---	---	---	0.5	---	---	---
406A---------- Dorset	3s	4.0	70	13.0	2.0	26	31	61
406B---------- Dorset	3s	3.5	65	13.0	2.0	24	29	57
418---------- Lamoure	2w	4.5	80	14.0	4.0	28	31	52
422B---------- Bygland	2e	5.5	105	16.0	3.3	36	40	69
422C---------- Bygland	3e	5.5	95	14.0	2.8	33	37	62
426---------- Foldahl	3s	5.0	85	14.0	3.0	29	33	56

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
441A---------- Almora	2s	4.2	75	14.0	2.8	28	33	66
441B---------- Almora	2e	4.0	70	13.0	2.0	26	31	61
441C---------- Almora	3e	3.5	60	13.0	2.0	23	26	53
481---------- Kratka	3w	3.5	80	14.0	4.0	30	35	70
494---------- Darnen	1	5.9	115	16.0	3.3	40	45	75
497---------- Hantho	1	5.7	120	17.0	3.3	42	46	78
508---------- Wyndmere	2s	5.5	100	15.0	3.3	35	39	65
540---------- Seelyeville	6w	---	---	---	---	---	---	---
541---------- Rifle	6w	---	---	---	---	---	---	---
544---------- Cathro	6w	---	---	---	---	---	---	---
567A---------- Verndale	3s	4.0	70	13.0	2.0	26	31	61
567B---------- Verndale	3s	3.5	65	13.0	2.0	24	29	57
609B---------- Dickey	3e	4.2	75	14.0	2.0	26	29	49
624---------- Rosy	1	4.2	75	14.0	3.3	28	33	66
646C---------- Peever	3e	5.2	90	15.0	2.8	31	35	59

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
646D---------- Peever	4e	4.0	75	14.0	1.5	26	29	49
670---------- Knute	1	5.6	110	16.0	3.3	38	42	72
680---------- Parnell	2w	4.0	100	15.0	4.0	35	39	65
698---------- Doran	1	5.5	105	16.0	3.3	36	40	69
701---------- Runeberg	6w	---	---	---	3.5	---	---	---
705B----------		4.6	85	14.0	2.3	30	34	66
Nitche----------	3s							
Kandota---------	2e							
Lida----------	3s							
705C----------		3.9	70	13.0	2.2	25	29	55
Nitche----------	4e							
Kandota---------	3e							
Lida----------	4e							
707B---------- Lizzie	2e	5.5	100	14.0	3.0	36	41	76
707C2---------- Lizzie	3e	5.2	90	15.0	2.8	33	37	71
707D2---------- Lizzie	4e	4.0	70	13.0	2.0	25	29	55
710----------		4.7	100	15.0	3.7	36	41	75
Friberg---------	2w							
Weetown---------	2e							
711B---------- Arvilla-Sandberg	4s	3.2	60	12.0	1.9	22	26	52

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
711C----------		2.3	45	11.0	1.4	16	19	38
Arvilla---------	4e							
Sandberg--------	6s							
715----------		3.9	65	13.0	2.3	25	29	58
Bluffcreek------	3s							
Clearriver------	4s							
716B----------		3.7	65	13.0	1.9	24	27	53
Leaflake--------	3s							
Eagleview-------	4s							
716C----------		3.1	55	12.0	1.5	20	23	45
Leaflake--------	4e							
Eagleview-------	4s							
716D----------		2.3	45	9.0	0.9	15	17	33
Leaflake--------	6e							
Eagleview-------	6s							
718E----------	6e	3.0	---	---	1.5	---	19	33
Naytahwaush								
721B----------	4s	2.5	45	11.0	1.5	17	20	39
Corliss								
721C----------	4s	1.5	35	10.0	1.0	13	15	30
Corliss								
721D----------	6e	1.0	25	8.0	0.8	9	11	20
Corliss								
721E----------	7e	---	---	---	0.8	---	---	---
Corliss								
726----------	6w	---	---	---	3.5	---	---	---
Kratka								

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
746---------- Haslie	6w	---	---	---	---	---	---	---
760C2----------		5.0	85	15.0	2.7	32	36	68
Chapett---------	3e							
Sisseton--------	6e							
760D2----------		3.8	65	13.0	1.9	24	27	52
Chapett---------	4e							
Sisseton--------	6e							
769B---------- Mehurin	2e	5.6	110	16.0	3.3	38	42	72
776B----------		4.6	80	14.0	2.7	30	33	65
Snellman--------	2e							
Sugarbush-------	3s							
776C----------		3.8	65	13.0	2.5	24	28	58
Snellman--------	3e							
Sugarbush-------	4e							
776E---------- Snellman-Sugarbush	6e	2.4	40	10.0	1.2	4	18	34
777C2----------		4.8	85	14.0	2.6	28	35	66
Sisseton--------	6e							
Heimdal---------	3e							
777D2----------		3.7	65	13.0	1.9	22	26	50
Sisseton--------	6e							
Heimdal---------	4e							
777E---------- Sisseton-Heimdal	7e	---	---	---	1.5	---	---	---

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
778B---------- Dorset----------	3s	3.2	60	12.0	1.9	25	27	52
Corliss---------	4s							
778C---------- Dorset----------	4e	2.4	45	11.0	1.5	17	19	38
Corliss---------	4s							
779B---------- Peever-Mehurin	2e	5.5	105	16.0	3.1	36	40	68
902B---------- Barnes-Buse	2e	5.6	110	16.0	2.9	37	43	72
903C2---------- Barnes----------	3e	5.1	90	15.0	2.7	30	35	58
Langhei---------	4e							
915C2---------- Forman-Buse	3e	5.3	90	15.0	2.7	30	36	60
915D2---------- Forman-Buse	4e	4.1	75	14.0	1.9	24	28	48
931C2---------- Formdale--------	3e	5.3	100	15.0	2.7	32	37	64
Langhei---------	4e							
931D2---------- Formdale--------	4e	4.1	80	14.0	1.9	25	30	52
Langhei---------	6e							
942D2---------- Langhei---------	6e	3.2	70	13.0	1.9	20	27	45
Barnes----------	4e							

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
957B2---------- Rothsay---------	2e	5.6	110	16.0	3.0	36	43	73
Zell----------	3e							
969C2---------- Zell----------	6e	5.2	90	14.0	2.6	29	36	60
Rothsay---------	3e							
969D2---------- Zell----------	6e	3.7	75	13.0	1.9	23	28	48
Rothsay---------	4e							
1015---------- Udipsamments	8s	---	---	---	---	---	---	---
1016, 1027------- Udorthents	6s	---	---	---	---	---	---	---
1030: Pits.								
Udipsamments----	8s	---	---	---	---	---	---	---
1077---------- Forada and Leafriver	6w	---	---	---	3.5	---	---	---
1102B---------- Chapett---------	2e	4.7	90	15.0	2.6	32	37	69
Dorset----------	3s							
1102C---------- Chapett---------	3e	4.3	75	14.0	2.4	27	31	60
Dorset----------	4e							

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
1103---------- Clitherall	3s	4.5	80	14.0	2.5	29	33	63
1104B----------		4.8	95	15.0	2.6	34	39	68
Waukon----------	2e							
Dorset----------	3s							
1104C----------		4.5	80	14.0	2.4	29	32	57
Waukon----------	3e							
Dorset----------	4e							
1104D----------		3.1	55	12.0	1.5	20	23	39
Waukon----------	4e							
Dorset----------	6e							
1105B---------- Dent	2e	5.5	100	15.0	3.3	36	41	76
1110---------- Isan	4w	3.0	60	13.0	3.8	23	26	53
1111---------- Nidaros	6w	---	---	---	---	---	---	---
1112D----------		2.7	50	11.0	1.5	18	21	40
Chapett---------	4e							
Corliss---------	6e							
1112E---------- Chapett-Corliss	7e	---	---	---	1.2	---	---	---
1113---------- Haslie, Seelyeville, and Cathro	8w	---	---	---	---	---	---	---
1114---------- Hangaard	4w	---	---	---	2.5	---	---	---

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
1120----------		---	---	---	2.1	---	---	---
Rushlake--------	4s							
Hangaard--------	4w							
1129----------	2w	3.5	95	15.0	4.0	33	37	62
Lindaas								
1131B----------		3.3	60	13.0	1.9	22	26	53
Verndale--------	3s							
Abbeylake-------	4s							
1136----------	6w	---	---	---	---	---	---	---
Nidaros								
1149----------	2s	5.6	115	16.0	3.3	40	45	75
Hamerly								
1195A----------		3.4	60	13.0	1.9	24	27	55
Sybil----------	3s							
Eagleview-------	4s							
1195B----------		3.1	55	12.0	1.9	21	24	49
Sybil----------	3s							
Eagleview-------	4s							
1195C----------		2.7	45	11.0	1.5	17	20	39
Sybil----------	4e							
Eagleview-------	4s							
1195E----------		1.0	25	7.0	0.8	9	12	22
Sybil----------	6e							
Eagleview-------	6s							
1196B----------		3.2	55	12.0	1.9	21	24	51
Lida----------	3s							
Two Inlets------	4s							

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
1196C---------- Lida----------	4e	2.7	45	11.0	1.5	17	20	40
Two Inlets------	4s							
1196E---------- Lida----------	6e	1.3	25	7.0	0.8	9	12	22
Two Inlets------	6s							
1196F---------- Lida----------	7e	---	---	---	0.5	---	---	---
Two Inlets------	7s							
1200---------- Egglake	2w	3.0	80	14.0	4.0	29	33	63
1208B---------- Naytahwaush-----	3e	5.6	105	16.0	3.1	36	40	68
Mahkonce--------	2s							
1209C---------- Naytahwaush	3e	5.2	90	15.0	2.8	31	35	59
1212B---------- Mahkonce	2s	5.6	110	16.0	3.3	38	42	72
1214---------- Mustinka	2w	4.5	115	16.0	4.0	40	45	75
1215---------- Pinelake	2w	3.0	75	14.0	3.8	28	33	66
1216B---------- Egglake---------	2w	3.9	85	14.0	3.8	31	35	67
Wykeham---------	2e							
1217E---------- Waukon----------	7e	1.8	---	---	1.2	---	---	---
Lida----------	6e							

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
1218B---------- Snellman--------	2e	4.6	80	14.0	2.6	29	33	65
Lida----------	3s							
1218C---------- Snellman--------	3e	3.6	65	13.0	2.3	23	27	52
Lida----------	4e							
1218E---------- Snellman-Lida	6e	2.5	45	10.0	1.2	4	18	35
1218F---------- Snellman-Lida	7e	---	---	---	1.2	---	---	---
1219C---------- Sandberg--------	6s	2.1	40	11.0	1.3	15	18	36
Sverdrup--------	4e							
1221B---------- Sverdrup--------	3e	3.1	60	12.0	1.8	25	25	49
Sandberg--------	4s							
1223D---------- Sandberg-Arvilla	6e	1.2	25	8.0	0.9	10	12	22
1227---------- Quam, Cathro, and Urness	8w	---	---	---	---	---	---	---
1230---------- Haslie and Nidaros	8w	---	---	---	---	---	---	---
1232B---------- Chapett	2e	5.5	105	16.0	3.0	38	43	78
1232E---------- Chapett	7e	---	---	---	1.5	---	---	---

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
1234B---------- Formdale-Buse	2e	5.7	120	17.0	2.9	40	46	79
1237---------- Lakepark	2w	4.0	105	16.0	4.0	36	40	69
1239---------- Quam	3w	3.5	85	14.0	4.0	29	33	56
1240---------- Roliss	2w	5.5	105	16.0	3.3	32	40	69
1247D---------- Corliss-Dorset	6e	1.2	25	8.0	0.9	10	12	22
1250C----------		2.9	40	11.0	1.3	15	18	35
Abbeylake-------	4s							
Verndale--------	4e							
1259----------		5.3	115	16.0	3.5	37	45	75
Hamerly---------	2s							
Mustinka--------	2w							
1275B----------		3.7	65	10.0	3.2	24	27	51
Kandota---------	2e							
Egglake---------	6w							
1275C----------		2.8	50	9.0	3.1	18	21	40
Kandota---------	3e							
Egglake---------	6w							
1276----------		4.6	95	15.0	3.6	34	38	72
Knute----------	1							
Brandsvold------	2w							
1277D---------- Corliss-Sverdrup	6e	1.2	25	8.0	0.9	10	12	22

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
1289---------- Knute	1	5.5	100	15.0	3.3	36	41	76
1290---------- Brandsvold	2w	3.0	80	14.0	4.0	29	33	63
1291---------- Sedgeville	6w	---	---	---	3.8	---	---	---
1293---------- Sedgeville	2w	3.0	70	13.0	3.8	26	31	61
1304A---------- Glyndon	2s	5.6	110	16.0	3.0	38	42	72
1307---------- Rushlake	4s	2.5	45	11.0	2.0	17	20	39
1317---------- Vallers	2w	5.5	100	15.0	3.3	35	39	65
1319B---------- Rockwood	2e	5.2	90	15.0	3.0	33	37	71
1319C---------- Rockwood	3e	4.0	75	14.0	2.8	25	30	59
1319D---------- Rockwood	4e	3.0	60	13.0	2.0	20	25	45
1320B---------- Blowers	2e	5.2	90	15.0	3.0	33	37	71
1321---------- Paddock-Becida	2w	4.0	80	14.0	3.7	29	33	65
1322---------- Wolverton	2s	5.2	90	15.0	3.0	31	35	59
1324B----------		5.3	100	15.0	3.0	35	40	74
Heimdal---------	2e							
Sisseton--------	3e							

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
1338---------- Oakcreek	2s	4.5	80	14.0	2.8	30	35	70
1339---------- Borup	6w	---	---	---	3.5	---	---	---
1340----------		3.7	70	13.0	2.9	25	30	60
Bluffcreek------	3s							
Epoufette-------	4w							
1341----------		4.9	85	14.0	2.8	31	35	67
Clitherall------	3s							
Wykeham---------	1							
1342---------- Pinelake-Brandsvold	2w	3.0	75	14.0	3.9	28	33	65
1343C----------		3.7	65	13.0	2.1	24	27	54
Lida----------	4e							
Almora----------	3e							
Lizzie----------	3e							
1344B----------		4.2	75	14.0	2.3	27	32	62
Lida----------	3s							
Almora----------	2e							
Dent----------	2e							
1345----------		4.1	70	13.0	2.8	27	32	63
Bluffcreek------	3s							
Rosy----------	1							
1346---------- Nidaros	6w	---	---	---	---	---	---	---

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Corn silage	Kentucky bluegrass	Soybeans	Spring wheat	Oats
		Tons	Bu	Tons	AUM*	Bu	Bu	Bu
1347B---------- Kandota	2e	5.5	95	15.0	3.0	35	39	75
1348---------- Knute	1	5.5	100	15.0	3.3	36	41	76
1349---------- Clotho	2w	3.0	80	14.0	4.0	25	33	63
1350---------- Brandsvold	2w	3.0	80	14.0	4.0	30	33	63
1351---------- Bluffton	6w	---	---	---	3.5	---	---	---
1365---------- Hillview	2w	3.5	75	14.0	3.8	28	33	66
1396----------		---	---	---	3.9	---	---	---
Sedgeville------	6w							
Nidaros---------	6w							
Aquolls---------	5w							
1397---------- Bemidji	3s	4.5	75	14.0	2.0	30	33	65
1825B---------- Seelyeville	6w	---	---	---	---	---	---	---
1874---------- Radium	4s	3.0	55	12.0	2.0	20	24	48
1943---------- Roscommon	4w	2.5	55	12.0	3.8	20	24	48
1975---------- Oylen	3s	4.0	70	13.0	2.5	26	31	61

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

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
26	Aazdahl clay loam
38B	Waukon loam, 2 to 6 percent slopes
46	Borup loam (where drained)
53B	Kandota sandy loam, 2 to 6 percent slopes
58	Kittson loam
59	Grimstad fine sandy loam
61	Arveson loam (where drained)
63	Rockwell loam (where drained)
107	Winger silt loam (where drained)
108	McIntosh silt loam
121	Wykeham fine sandy loam
141B	Egeland fine sandy loam, 1 to 6 percent slopes
168B	Forman clay loam, 2 to 6 percent slopes
180	Gonvick loam
184	Hamerly loam
267B	Snellman sandy loam, 2 to 8 percent slopes
290	Rothsay silt loam
293B	Swenoda fine sandy loam, 1 to 4 percent slopes
339	Fordville loam
371	Clontarf sandy loam
375	Forada loam (where drained)
418	Lamoure silty clay loam, occasionally flooded (where drained)
422B	Bygland silty clay loam, 1 to 6 percent slopes
426	Foldahl loamy fine sand
441A	Almora loam, 0 to 2 percent slopes
441B	Almora loam, 2 to 6 percent slopes
481	Kratka fine sandy loam (where drained)
494	Darnen loam, moderately wet
497	Hantho silt loam
508	Wyndmere fine sandy loam
624	Rosy sandy loam
670	Knute fine sandy loam
680	Parnell silt loam (where drained)
698	Doran clay loam
707B	Lizzie silt loam, 2 to 6 percent slopes
710	Friberg-Weetown complex (where drained)
769B	Mehurin clay loam, 1 to 4 percent slopes
779B	Peever-Mehurin complex, 2 to 6 percent slopes
902B	Barnes-Buse complex, 2 to 6 percent slopes
957B2	Rothsay-Zell complex, 2 to 6 percent slopes, eroded
1105B	Dent silt loam, 1 to 6 percent slopes
1129	Lindaas silty clay loam, morainic (where drained)
1149	Hamerly clay loam
1200	Egglake loam (where drained)
1208B	Naytahwaush-Mahkonce complex, 1 to 8 percent slopes
1212B	Mahkonce clay loam, 1 to 4 percent slopes
1214	Mustinka silty clay loam (where drained)
1215	Pinelake sandy loam (where drained)
1216B	Egglake-Wykeham complex, 0 to 5 percent slopes (where drained)
1232B	Chapett loam, 2 to 6 percent slopes
1234B	Formdale-Buse complex, 2 to 6 percent slopes
1237	Lakepark loam (where drained)
1240	Roliss clay loam (where drained)
1259	Hamerly-Mustinka complex (where drained)
1276	Knute-Brandsvold complex, thick solum (where drained)
1289	Knute fine sandy loam, thick solum
1290	Brandsvold fine sandy loam, thick solum (where drained)

Prime Farmland--Continued

Map symbol	Soil name
1293	Sedgeville fine sandy loam, rarely flooded (where drained)
1304A	Glyndon very fine sandy loam
1317	Vallers silty clay loam (where drained)
1319B	Rockwood sandy loam, 2 to 6 percent slopes, stony
1320B	Blowers sandy loam, 1 to 5 percent slopes, stony
1321	Paddock-Becida complex, stony (where drained)
1322	Wolverton very fine sandy loam
1324B	Heimdal-Sisseton complex, 2 to 6 percent slopes
1338	Oakcreek loam
1342	Pinelake, loamy substratum-Brandsvold complex (where drained)
1347B	Kandota loam, 1 to 6 percent slopes
1348	Knute loam, thick solum
1349	Clotho loam, moderately permeable (where drained)
1350	Brandsvold loam, thick solum (where drained)
1365	Hillview fine sandy loam (where drained)

Windbreaks and Environmental Plantings

(Absence of an entry indicates that trees generally do not grow to the given height)

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7A, 7B, 7C:					
Hubbard	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
26:					
Aazdahl	Nanking cherry	Amur maple, Siberian peashrub, lilac.	Hackberry, Russian-olive, green ash, white spruce, ponderosa pine, common chokecherry.	---	Carolina poplar, Siouxland cottonwood.
34:					
Parnell	---	Gray dogwood, redosier dogwood, silver buffaloberry.	Black ash, green ash, tamarack, white spruce, black spruce, northern whitecedar.	Eastern cottonwood, golden willow.	Robusta cottonwood.
38B, 38C2, 38D2, 38E:					
Waukon	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
46:					
Borup	Redosier dogwood	American plum, common chokecherry, silver buffaloberry, lilac, northern whitecedar.	Hackberry, Russian-olive, white spruce.	Green ash, golden willow.	Siouxland cottonwood.
53B, 53C, 53D:					
Kandota	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
58:					
Kittson	Nanking cherry	Amur maple, Siberian peashrub, lilac.	Hackberry, Russian-olive, green ash, white spruce, ponderosa pine, common chokecherry.	---	Carolina poplar, Siouxland cottonwood.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
59:					
Grimstad	---	Siberian peashrub, sargent crabapple, common chokecherry, lilac, northern whitecedar.	Hackberry, Russian-olive, white spruce, ponderosa pine.	Green ash	Eastern cottonwood, Siouxland cottonwood.
61:					
Arveson	Redosier dogwood	American plum, common chokecherry, silver buffaloberry, lilac.	Hackberry, Russian-olive, green ash, white spruce, northern whitecedar.	Golden willow	Siouxland cottonwood.
63:					
Rockwell	Redosier dogwood	American plum, common chokecherry, silver buffaloberry, lilac.	Hackberry, Russian-olive, green ash, white spruce, northern whitecedar.	Golden willow	Siouxland cottonwood.
65:					
Foxhome	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, bur oak.	Russian-olive, green ash, white spruce, ponderosa pine, common chokecherry.	---	Eastern cottonwood.
66:					
Flaming	Nanking cherry	Amur maple, Siberian peashrub, lilac.	Hackberry, Russian-olive, green ash, white spruce, ponderosa pine, common chokecherry.	---	Carolina poplar, Siouxland cottonwood.
68:					
Arveson	---	Gray dogwood, redosier dogwood, silver buffaloberry.	Black ash, green ash, tamarack, white spruce, black spruce, northern whitecedar.	Eastern cottonwood, golden willow.	Robusta cottonwood.
107:					
Winger	Redosier dogwood	American plum, common chokecherry, silver buffaloberry, lilac.	Hackberry, Russian-olive, green ash, white spruce, northern whitecedar.	Golden willow	Siouxland cottonwood.
108:					
McIntosh	---	Siberian peashrub, sargent crabapple, common chokecherry, lilac, northern whitecedar.	Hackberry, Russian-olive, white spruce, ponderosa pine.	Green ash	Eastern cottonwood, Siouxland cottonwood.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
121:					
Wykeham	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
127A, 127B, 127C:					
Sverdrup	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, bur oak.	Russian-olive, green ash, white spruce, ponderosa pine, common chokecherry.	---	Eastern cottonwood.
141B, 141C, 141D:					
Egeland	Peking cotoneaster	Amur maple, Siberian peashrub, lilac.	Hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.
168B:					
Forman	Peking cotoneaster, Nanking cherry.	Siberian peashrub, American plum, lilac.	Russian-olive, green ash, Black Hills spruce.	Hackberry	Silver maple, Carolina poplar, Siouxland cottonwood.
180:					
Gonvick	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
184:					
Hamerly	---	Siberian peashrub, sargent crabapple, common chokecherry, lilac, northern whitecedar.	Hackberry, Russian-olive, white spruce, ponderosa pine.	Green ash	Eastern cottonwood, Siouxland cottonwood.
187:					
Haug	Redosier dogwood	Siberian peashrub, gray dogwood, silver buffaloberry.	Hackberry, Russian-olive, white spruce, northern whitecedar.	White willow, golden willow, Siberian elm.	Eastern cottonwood.
191:					
Epoufette	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
202:					
Meehan	Nanking cherry	Siberian peashrub, lilac.	Amur maple, hackberry, Russian-olive, Black Hills spruce, red pine.	Green ash	Silver maple, Carolina poplar, Siouxland cottonwood.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
258A, 258B, 258C:					
Sandberg	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
260:					
Duelm	Nanking cherry	Siberian peashrub, lilac.	Amur maple, hackberry, Russian-olive, Black Hills spruce, red pine.	Green ash	Silver maple, Carolina poplar, Siouxland cottonwood.
267B, 267C, 267E:					
Snellman	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
290:					
Rothsay	Peking cotoneaster, Nanking cherry.	Siberian peashrub, American plum, lilac.	Russian-olive, green ash, Black Hills spruce.	Hackberry	Silver maple, Carolina poplar, Siouxland cottonwood.
293B:					
Swenoda	Peking cotoneaster	Siberian peashrub, American plum, lilac.	Amur maple, hackberry, white spruce, Black Hills spruce, ponderosa pine.	Green ash	Silver maple, eastern cottonwood.
335:					
Urness	Redosier dogwood	Siberian peashrub, gray dogwood, silver buffaloberry.	Hackberry, Russian-olive, white spruce, northern whitecedar.	White willow, golden willow, Siberian elm.	Eastern cottonwood.
339:					
Fordville	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
341A, 341B:					
Arvilla	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
371:					
Clontarf	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
375:					
Forada	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
402C, 402E:					
Sioux	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
406A, 406B:					
Dorset	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
418:					
Lamoure	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	White spruce, Black Hills spruce, northern whitecedar.	Hackberry, green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
422B, 422C:					
Bygland	Hedge cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
426:					
Foldahl	Nanking cherry	Amur maple, Siberian peashrub, lilac.	Hackberry, Russian-olive, green ash, white spruce, ponderosa pine, common chokecherry.	---	Carolina poplar, Siouxland cottonwood.
441A, 441B, 441C:					
Almora	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
481:					
Kratka	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	White spruce, Black Hills spruce, northern whitecedar.	Hackberry, green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
494:					
Darnen	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
497:					
Hantho	Peking cotoneaster, Nanking cherry.	Siberian peashrub, American plum, lilac.	Russian-olive, green ash, Black Hills spruce.	Hackberry	Silver maple, Carolina poplar, Siouxland cottonwood.
508:					
Wyndmere	---	Siberian peashrub, sargent crabapple, common chokecherry, lilac, northern whitecedar.	Hackberry, Russian-olive, white spruce, ponderosa pine.	Green ash	Eastern cottonwood, Siouxland cottonwood.
567A, 567B:					
Verndale	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
609B:					
Dickey	Peking cotoneaster	Siberian peashrub, American plum, lilac.	Amur maple, hackberry, white spruce, Black Hills spruce, ponderosa pine.	Green ash	Silver maple, eastern cottonwood.
624:					
Rosy	Peking cotoneaster	Amur maple, Siberian peashrub, lilac.	Hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.
646C, 646D:					
Peever	Hedge cotoneaster, American plum, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Hackberry, Russian-olive, green ash, Black Hills spruce.	Silver maple	Eastern cottonwood.
670:					
Knute	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
680:					
Parnell	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	White spruce, Black Hills spruce, northern whitecedar.	Hackberry, green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
698:					
Doran	Hedge cotoneaster, American plum, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Hackberry, Russian-olive, green ash, Black Hills spruce.	Silver maple	Eastern cottonwood.
701:					
Runeberg	---	Gray dogwood, redosier dogwood, silver buffaloberry.	Black ash, green ash, tamarack, white spruce, black spruce, northern whitecedar.	Eastern cottonwood, golden willow.	Robusta cottonwood.
705B, 705C:					
Nitche	Peking cotoneaster	Amur maple, Siberian peashrub, lilac.	Hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.
Kandota	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
Lida	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
707B, 707C2, 707D2:					
Lizzie	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
710:					
Friberg	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
Weetown	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
711B, 711C:					
Arvilla	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Sandberg	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
715:					
Bluffcreek	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Clearriver	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
716B, 716C, 716D:					
Leaflake	Peking cotoneaster	Amur maple, Siberian peashrub, lilac.	Hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.
Eagleview	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
718E:					
Naytahwaush	Hedge cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
721B, 721C, 721D, 721E:					
Corliss	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
726:					
Kratka	---	Gray dogwood, redosier dogwood, silver buffaloberry, lilac.	Black ash, tamarack, white spruce, black spruce, northern whitecedar.	Golden willow	Eastern cottonwood, robusta cottonwood.
760C2, 760D2:					
Chapett	Peking cotoneaster, Nanking cherry.	Siberian peashrub, American plum, lilac.	Russian-olive, green ash, Black Hills spruce.	Hackberry	Silver maple, Carolina poplar, Siouxland cottonwood.
Sisseton	Siberian peashrub, lilac.	Hackberry, gray dogwood, Russian-olive, eastern redcedar, ponderosa pine, American plum, silver buffaloberry.	Green ash, Siberian elm.	Siouxland cottonwood.	---
769B:					
Mehurin	Hedge cotoneaster, American plum, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Hackberry, Russian-olive, green ash, Black Hills spruce.	Silver maple	Eastern cottonwood.
776B, 776C, 776E:					
Snellman	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
Sugarbush	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
777C2, 777D2, 777E:					
Sisseton	Siberian peashrub, lilac.	Hackberry, gray dogwood, Russian-olive, eastern redcedar, ponderosa pine, American plum, silver buffaloberry.	Green ash, Siberian elm.	Siouxland cottonwood.	---
Heimdal	Peking cotoneaster, Nanking cherry.	Siberian peashrub, American plum, lilac.	Russian-olive, green ash, Black Hills spruce.	Hackberry	Silver maple, Carolina poplar, Siouxland cottonwood.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
778B, 778C:					
Dorset	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Corliss	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
779B:					
Peever	Hedge cotoneaster, American plum, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Hackberry, Russian-olive, green ash, Black Hills spruce.	Silver maple	Eastern cottonwood.
Mehurin	Hedge cotoneaster, American plum, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Hackberry, Russian-olive, green ash, Black Hills spruce.	Silver maple	Eastern cottonwood.
902B:					
Barnes	Peking cotoneaster, Nanking cherry.	Siberian peashrub, American plum, lilac.	Russian-olive, green ash, Black Hills spruce.	Hackberry	Silver maple, Carolina poplar, Siouxland cottonwood.
Buse	Siberian peashrub, lilac.	Hackberry, gray dogwood, Russian-olive, eastern redcedar, ponderosa pine, American plum, silver buffaloberry.	Green ash, Siberian elm.	Siouxland cottonwood.	---
903C2:					
Barnes	Peking cotoneaster, Nanking cherry.	Siberian peashrub, American plum, lilac.	Russian-olive, green ash, Black Hills spruce.	Hackberry	Silver maple, Carolina poplar, Siouxland cottonwood.
Langhei	Siberian peashrub, lilac.	Hackberry, gray dogwood, Russian-olive, eastern redcedar, ponderosa pine, American plum, silver buffaloberry.	Green ash, Siberian elm.	Siouxland cottonwood.	---

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
915C2, 915D2:					
Forman	Peking cotoneaster, Nanking cherry.	Siberian peashrub, American plum, lilac.	Russian-olive, green ash, Black Hills spruce.	Hackberry	Silver maple, Carolina poplar, Siouxland cottonwood.
Buse	Siberian peashrub, lilac.	Hackberry, gray dogwood, Russian-olive, eastern redcedar, ponderosa pine, American plum, silver buffaloberry.	Green ash, Siberian elm.	Siouxland cottonwood.	---
931C2, 931D2:					
Formdale	Peking cotoneaster, Nanking cherry.	Siberian peashrub, American plum, lilac.	Russian-olive, green ash, Black Hills spruce.	Hackberry	Silver maple, Carolina poplar, Siouxland cottonwood.
Langhei	Siberian peashrub, lilac.	Hackberry, gray dogwood, Russian-olive, eastern redcedar, ponderosa pine, American plum, silver buffaloberry.	Green ash, Siberian elm.	Siouxland cottonwood.	---
942D2:					
Langhei	Siberian peashrub, lilac.	Hackberry, gray dogwood, Russian-olive, eastern redcedar, ponderosa pine, American plum, silver buffaloberry.	Green ash, Siberian elm.	Siouxland cottonwood.	---
Barnes	Peking cotoneaster, Nanking cherry.	Siberian peashrub, American plum, lilac.	Russian-olive, green ash, Black Hills spruce.	Hackberry	Silver maple, Carolina poplar, Siouxland cottonwood.
957B2:					
Rothsay	Peking cotoneaster, Nanking cherry.	Siberian peashrub, American plum, lilac.	Russian-olive, green ash, Black Hills spruce.	Hackberry	Silver maple, Carolina poplar, Siouxland cottonwood.
Zell	Siberian peashrub, lilac.	Hackberry, gray dogwood, Russian-olive, eastern redcedar, ponderosa pine, American plum, silver buffaloberry.	Green ash, Siberian elm.	Siouxland cottonwood.	---

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
969C2, 969D2:					
Zell	Siberian peashrub, lilac.	Hackberry, gray dogwood, Russian-olive, eastern redcedar, ponderosa pine, American plum, silver buffaloberry.	Green ash, Siberian elm.	Siouxland cottonwood.	---
Rothsay	Peking cotoneaster, Nanking cherry.	Siberian peashrub, American plum, lilac.	Russian-olive, green ash, Black Hills spruce.	Hackberry	Silver maple, Carolina poplar, Siouxland cottonwood.
1077:					
Forada	---	Gray dogwood, redosier dogwood, silver buffaloberry.	Black ash, green ash, tamarack, white spruce, black spruce, northern whitecedar.	Eastern cottonwood, golden willow.	Robusta cottonwood.
Leafriver	---	Gray dogwood, redosier dogwood, silver buffaloberry.	Black ash, tamarack, white spruce, black spruce, northern whitecedar.	Eastern cottonwood, golden willow.	Robusta cottonwood.
1102B, 1102C:					
Chapett	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
Dorset	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
1103:					
Clitherall	Peking cotoneaster	Amur maple, Siberian peashrub, lilac.	Hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.
1104B, 1104C, 1104D:					
Waukon	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
Dorset	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1105B:					
Dent	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
1110:					
Isan	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1112D, 1112E:					
Chapett	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
Corliss	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
1114:					
Hangaard	Redosier dogwood	American plum, common chokecherry, silver buffaloberry, lilac, northern whitecedar.	Hackberry, Russian-olive, white spruce.	Green ash, golden willow.	Siouxland cottonwood.
1120:					
Rushlake	Nanking cherry	Siberian peashrub, lilac.	Amur maple, hackberry, Russian-olive, Black Hills spruce, red pine.	Green ash	Silver maple, Carolina poplar, Siouxland cottonwood.
Hangaard	Redosier dogwood	American plum, common chokecherry, silver buffaloberry, lilac, northern whitecedar.	Hackberry, Russian-olive, white spruce.	Green ash, golden willow.	Siouxland cottonwood.
1129:					
Lindaas	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1131B:					
Verndale	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
Abbeylake	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
1149:					
Hamerly	---	Siberian peashrub, sargent crabapple, common chokecherry, lilac, northern whitecedar.	Hackberry, Russian-olive, white spruce, ponderosa pine.	Green ash	Eastern cottonwood, Siouxland cottonwood.
1195A, 1195B, 1195C, 1195E:					
Sybil	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Eagleview	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
1196B, 1196C, 1196E:					
Lida	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Two Inlets	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1200:					
Egglake---------	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1208B:					
Naytahwaush-----	Hedge cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
Mahkonce--------	Hedge cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
1209C:					
Naytahwaush-----	Hedge cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
1212B:					
Mahkonce--------	Hedge cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
1214:					
Mustinka--------	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	White spruce, Black Hills spruce, northern whitecedar.	Hackberry, green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1215:					
Pinelake--------	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1216B:					
Egglake---------	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
Wykeham---------	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
1217E:					
Waukon	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
Lida	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
1218B, 1218C, 1218E:					
Snellman	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
Lida	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
1219C:					
Sandberg	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
Sverdrup	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
1221B:					
Sverdrup	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Sandberg	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
1223D:					
Sandberg	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
Arvilla	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
1232B, 1232E:					
Chapett	Peking cotoneaster, Nanking cherry.	Siberian peashrub, American plum, lilac.	Russian-olive, green ash, Black Hills spruce.	Hackberry	Silver maple, Carolina poplar, Siouxland cottonwood.
1234B:					
Formdale	Peking cotoneaster, Nanking cherry.	Siberian peashrub, American plum, lilac.	Russian-olive, green ash, Black Hills spruce.	Hackberry	Silver maple, Carolina poplar, Siouxland cottonwood.
Buse	Siberian peashrub, lilac.	Hackberry, gray dogwood, Russian-olive, eastern redcedar, ponderosa pine, American plum, silver buffaloberry.	Green ash, Siberian elm.	Siouxland cottonwood.	---
1237:					
Lakepark	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1239:					
Quam	Redosier dogwood	Gray dogwood, silver buffaloberry.	Hackberry, Russian-olive, green ash, white spruce, northern whitecedar.	White willow, golden willow, Siberian elm.	Eastern cottonwood.
1240:					
Roliss	Redosier dogwood	American plum, common chokecherry, silver buffaloberry, lilac.	Hackberry, Russian-olive, green ash, white spruce, northern whitecedar.	Golden willow	Siouxland cottonwood.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1247D:					
Corliss	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
Dorset	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
1250C:					
Abbeylake	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
Verndale	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
1259:					
Hamerly	---	Siberian peashrub, sargent crabapple, common chokecherry, lilac, northern whitecedar.	Hackberry, Russian-olive, white spruce, ponderosa pine.	Green ash	Eastern cottonwood, Siouxland cottonwood.
Mustinka	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	White spruce, Black Hills spruce, northern whitecedar.	Hackberry, green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1275B, 1275C:					
Kandota	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
Egglake	---	Gray dogwood, redosier dogwood, silver buffaloberry.	Black ash, green ash, tamarack, white spruce, black spruce, northern whitecedar.	Eastern cottonwood, golden willow.	Robusta cottonwood.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
1276:					
Knute	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
Brandsvold	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1277D:					
Corliss	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
Sverdrup	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
1289:					
Knute	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
1290:					
Brandsvold	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1304A:					
Glyndon	Lilac	Siberian peashrub, eastern redcedar, common chokecherry.	Russian-olive, white spruce, blue spruce, bur oak.	Golden willow, Siberian elm.	Eastern cottonwood.
1307:					
Rushlake	Nanking cherry	Siberian peashrub, lilac.	Amur maple, hackberry, Russian-olive, Black Hills spruce, red pine.	Green ash	Silver maple, Carolina poplar, Siouxland cottonwood.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1317:					
Vallers	Redosier dogwood	American plum, common chokecherry, silver buffaloberry, lilac, northern whitecedar.	Hackberry, Russian-olive, white spruce.	Green ash, golden willow.	Siouxland cottonwood.
1319B, 1319C, 1319D:					
Rockwood	Hedge cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
1320B:					
Blowers	Hedge cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
1321:					
Paddock	Hedge cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, American plum, lilac.	Hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Eastern cottonwood.
Becida	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1322:					
Wolverton	---	Siberian peashrub, sargent crabapple, common chokecherry, lilac, northern whitecedar.	Hackberry, Russian-olive, white spruce, ponderosa pine.	Green ash	Eastern cottonwood, Siouxland cottonwood.
1324B:					
Heimdal	Peking cotoneaster, Nanking cherry.	Siberian peashrub, American plum, lilac.	Russian-olive, green ash, Black Hills spruce.	Hackberry	Silver maple, Carolina poplar, Siouxland cottonwood.
Sisseton	Siberian peashrub, lilac.	Hackberry, gray dogwood, Russian-olive, eastern redcedar, ponderosa pine, American plum, silver buffaloberry.	Green ash, Siberian elm.	Siouxland cottonwood.	---

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
1338:					
Oakcreek	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
1339:					
Borup	Redosier dogwood	Siberian peashrub, gray dogwood, silver buffaloberry.	Hackberry, Russian-olive, white spruce, northern whitecedar.	White willow, golden willow, Siberian elm.	Eastern cottonwood.
1340:					
Bluffcreek	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Epoufette	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1341:					
Clitherall	Peking cotoneaster	Amur maple, Siberian peashrub, lilac.	Hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.
Wykeham	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
1342:					
Pinelake	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
Brandsvold	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1343C:					
Lida	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
1343C:					
Almora	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Lizzie	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
1344B:					
Lida	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Almora	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Dent	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
1345:					
Bluffcreek	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.
Rosy	Peking cotoneaster	Amur maple, Siberian peashrub, lilac.	Hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.
1347B:					
Kandota	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.
1348:					
Knute	Peking cotoneaster, Nanking cherry.	Amur maple, Siberian peashrub, lilac.	Sugar maple, hackberry, Russian-olive, Black Hills spruce.	Silver maple, green ash.	Carolina poplar.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
1349: Clotho	Redosier dogwood	American plum, common chokecherry, silver buffaloberry, lilac, northern whitecedar.	Hackberry, Russian-olive, white spruce.	Green ash, golden willow.	Siouxland cottonwood.
1350: Brandsvold	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1351: Bluffton	---	Gray dogwood, redosier dogwood, silver buffaloberry.	Black ash, green ash, tamarack, white spruce, black spruce, northern whitecedar.	Eastern cottonwood, golden willow.	Robusta cottonwood.
1365: Hillview	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1397: Bemidji	Peking cotoneaster	Amur maple, Siberian peashrub, lilac.	Hackberry, white spruce, Black Hills spruce, red pine.	Green ash, eastern white pine.	Silver maple, eastern cottonwood.
1874: Radium	---	Siberian peashrub, eastern redcedar, common chokecherry, silver buffaloberry, lilac.	Green ash, white spruce, ponderosa pine, red pine, Scotch pine.	Jack pine, eastern cottonwood.	---
1943: Roscommon	Peking cotoneaster, Nanking cherry.	Redosier dogwood, lilac.	Hackberry, white spruce, Black Hills spruce, northern whitecedar.	Green ash, golden willow.	Carolina poplar, Siouxland cottonwood.
1975: Oylen	Hedge cotoneaster, lilac.	Siberian peashrub, eastern redcedar, American plum, common chokecherry, bur oak.	Russian-olive, white spruce, red pine.	Green ash	Eastern cottonwood.

Windbreak Suitability Groups

(Suitable shrubs and trees with their mature heights are listed in the table "Windbreaks and Environmental Plantings." See text for descriptions of the suitability groups. Absence of an entry indicates that a windbreak suitability group is not assigned)

Map symbol and soil name	Windbreak suitability group
7A, 7B, 7C----- Hubbard	7
26---------- Aazdahl	1
34---------- Parnell	2W
38B, 38C2, 38D2, 38E----- Waukon	3
46---------- Borup	2K
53B, 53C, 53D-- Kandota	3
58---------- Kittson	1
59---------- Grimstad	1K
61---------- Arveson	2K
63---------- Rockwell	2K
65---------- Foxhome	6G
66---------- Flaming	1
68---------- Arveson	2W
107---------- Winger	2K
108---------- McIntosh	1K
127A, 127B, 127C---------- Sverdrup	6G
141B, 141C, 141D---------- Egeland	5
168B---------- Forman	3

Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
180 Gonvick	1
184 Hamerly	1K
187 Haug	2H
191 Epoufette	2
202 Meehan	1
258A, 258B, 258C Sandberg	7
260 Duelm	1
267B, 267C, 267E, 267F Snellman	3
290 Rothsay	3
293B Swenoda	5
335 Urness	2W
339 Fordville	6G
341A, 341B Arvilla	6G
371 Clontarf	1
375 Forada	2
402C, 402E Sioux	10
406A, 406B Dorset	6G
418 Lamoure	2K
422B, 422C Bygland	4
426 Foldahl	1

Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
441A, 441B, 441C---------- Almora	6G
481---------- Kratka	2
494---------- Darnen	3
497---------- Hantho	3
508---------- Wyndmere	1K
540---------- Seelyeville	2H
541---------- Rifle	2H
544---------- Cathro	2H
567A, 567B----- Verndale	7
609B---------- Dickey	5
624---------- Rosy	1
646C, 646D----- Peever	4C
670---------- Knute	1
680---------- Parnell	2
698---------- Doran	1
701---------- Runeberg	2W
705B, 705C:	
Nitche--------	5
Kandota-------	3
Lida----------	7
707B, 707C2, 707D2--------- Lizzie	3

Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
710:	
Friberg	2
Weetown	1
711B, 711C:	
Arvilla	6G
Sandberg	7
715:	
Bluffcreek	6G
Clearriver	7
716B, 716C, 716D:	
Leaflake	5
Eagleview	7
718E Naytahwaush	4C
721B, 721C, 721D, 721E Corliss	7
726 Kratka	10
746 Haslie	2H
760C2:	
Chapett	3
Sisseton	8
760D2:	
Chapett	3
Sisseton	10
776B, 776C, 776E:	
Snellman	3
Sugarbush	6G
777C2:	
Sisseton	8
Heimdal	3
777D2, 777E:	
Sisseton	10
Heimdal	3

Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
778B, 778C:	
Dorset	6G
Corliss	7
779B:	
Peever	4C
Mehurin.	
902B:	
Barnes	3
Buse	8
903C2:	
Barnes	3
Langhei	8
915C2, 915D2:	
Forman	3
Buse	8
931C2, 931D2:	
Formdale	3
Langhei	8
942D2:	
Langhei	8
Barnes	3
957B2:	
Rothsay	3
Zell	8
969C2:	
Zell	8
Rothsay	3
969D2:	
Zell	10
Rothsay	3
1077:	
Forada	10
Leafriver	10
1102B, 1102C:	
Chapett	3
Dorset	6G
1103 Clitherall	5

Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
1104B, 1104C, 1104D:	
Waukon	3
Dorset	6G
1105B Dent	3
1112D, 1112E:	
Chapett	3
Corliss	7
1113:	
Haslie	10
Seelyeville	10
Cathro	10
1114 Hangaard	2K
1120:	
Rushlake	1
Hangaard	2K
1129 Lindaas	2
1131B:	
Verndale	7
Abbeylake	7
1136 Nidaros	10
1149 Hamerly	1K
1195A, 1195B, 1195C, 1195E:	
Sybil	6G
Eagleview	7
1196B, 1196C, 1196E, 1196F:	
Lida	7
Two Inlets	7
1200 Egglake	2
1208B:	
Naytahwaush	4C
Mahkonce	4C

Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
1209C: Naytahwaush	4C
1212B: Mahkonce	4C
1214: Mustinka	2
1215: Pinelake	2
1216B:	
Egglake	2
Wykeham.	
1217E:	
Waukon	3
Lida	7
1218B, 1218C, 1218E, 1218F:	
Snellman	3
Lida	7
1219C:	
Sandberg	7
Sverdrup	6G
1221B:	
Sverdrup	6G
Sandberg	7
1223D:	
Sandberg	7
Arvilla	6G
1227:	
Quam	10
Cathro	10
Urness	10
1230:	
Haslie	10
Nidaros	10
1232B, 1232E: Chapett	3
1234B:	
Formdale	3
Buse	8

Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
1237 Lakepark	2
1239 Quam	2W
1240 Roliss	2K
1247D:	
Corliss	7
Dorset	6G
1250C:	
Abbeylake	7
Verndale	7
1259:	
Hamerly	1K
Mustinka	2
1275B, 1275C:	
Kandota	3
Egglake	10
1276:	
Knute	1
Brandsvold	2
1277D:	
Corliss	7
Sverdrup	6G
1289 Knute	1
1290 Brandsvold	2
1291 Sedgeville	10
1293 Sedgeville	2
1304A Glyndon	1K
1307 Rushlake	1
1317 Vallers	2K
1319B, 1319C, 1319D Rockwood	4F

Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
1320B: Blowers	4F
1321:	
Paddock	1
Becida	2
1322: Wolverton	1K
1324B:	
Heimdal	3
Sisseton	8
1338: Oakcreek	5
1339: Borup	10
1340:	
Bluffcreek	6G
Epoufette	2
1341:	
Clitherall	5
Wykeham.	
1342:	
Pinelake	2
Brandsvold	2
1343C:	
Lida	7
Almora	6G
Lizzie	3
1344B:	
Lida	7
Almora	6G
Dent	3
1345:	
Bluffcreek	6G
Rosy	1
1346: Nidaros	10
1347B: Kandota	3

Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
1348 Knute	1
1349 Clotho	2K
1350 Brandsvold	2
1351 Bluffton	10
1365 Hillview	2
1396:	
Sedgeville	10
Nidaros	10
Aquolls	10
1397 Bemidji	5
1874 Radium	1
1943 Roscommon	2

Forest Land

Chuck Cornelius, private forest management specialist, Minnesota Department of Natural Resources, helped prepare this section.

Forested areas cover approximately 200,500 acres in Otter Tail County, or about 16 percent of the total land area. About 82 percent of the forest land is privately owned, and 18 percent is publicly owned. Of the publicly owned lands, about 8,200 acres is county owned; 24,700 acres is owned by the State of Minnesota; 800 acres is Indian land; and 500 acres is Federal land.

The highly variable soil types and terrain conditions in Otter Tail County support a variety of timber types. Most tree species can grow under a wide variety of soil conditions. Aspen is the dominant tree species in Otter Tail County. This species makes up 38 percent of the commercial forest land. Hardwood forest types, which include aspen, maple, basswood, red oak, bur oak, paper birch, elm, and ash, make up 95 percent of the commercial forest land. Softwood forest types, which include tamarack, jack pine, balsam fir, black spruce, white spruce, red pine, and white pine, make up 5 percent of the commercial forest land.

Information about the hazards and limitations that should be considered in areas used as forest land are given in the tables "Forest Land Harvest Equipment Considerations," "Forest Haul Road Considerations," "Forest Log Landing Considerations," and "Forest Land Site Preparation and Planting Considerations."

Forest Land Harvest Equipment Considerations

For most soils spring is the most limiting season. Alternate thawing and freezing during snowmelt cause saturation and low strength of the surface soil layers. When thawing is complete, saturation continues for short periods in well drained soils to nearly all year in very poorly drained depressional soils. Degrees of wetness are generally proportionate to water table height and duration. The water table generally is lower in the summer during the heavy use of moisture by vegetation and is nearer the surface during periods when absorbed precipitation is greater than the vegetation requires. Harvesting during periods of saturation usually results in severe soil damage, except when the soil is frozen. The preferred season for timber harvest on many soils is winter, when wetness and low soil strength can be overcome by freezing.

Considerations shown in the table are as follows:

Slope.—The upper slope limit is more than 15 percent.

Flooding.—The map unit component is frequently flooded.

Wetness.—The map unit component is somewhat poorly drained, poorly drained, or very poorly drained or has a perched water table (any drainage class).

Depth to hard rock.—The depth to hard bedrock is less than 10 inches.

Rubbly surface.—The word "rubbly" is in the map unit name.

Surface stones.—The words "extremely stony" are in the map unit name.

Surface boulders.—The word "bouldery" is in the map unit name.

Areas of rock outcrop.—The words "Rock outcrop" are in the map unit name.

Susceptible to rutting and wheel slippage (low strength).—The AASHTO classification is A-6, A-7, or A-8 in any layer at a depth of 20 inches or less.

Poor traction (loose sandy material).—The USDA texture includes sands or loamy sands in any layer at a depth of 10 inches or less.

Forest Haul Road Considerations

Haul roads serve as transportation routes from log landings to primary roads. Generally, haul roads are unpaved, but some are graveled.

Considerations shown in the table are as follows:

Slope.—The slope is 8 percent or more.

Flooding.—The map unit component is frequently flooded.

Wetness.—The map unit component is somewhat poorly drained, poorly drained, or very poorly drained or has a perched water table (any drainage class).

Depth to hard rock.—The depth to hard bedrock is less than 20 inches.

Depth to soft rock.—The depth to soft bedrock is less than 20 inches.

Surface boulders.—The word “bouldery” is in the map unit name.

Areas of rock outcrop.—The words “Rock outcrop” are in the map unit name.

Low bearing strength.—The AASHTO classification is A-6, A-7, or A-8 in any layer at a depth of 20 inches or less.

Rubbly surface.—The word “rubbly” is in the map unit name.

Forest Log Landing Considerations

Log landings are areas where logs are assembled for transportation. Areas that require little or no cutting, filling, or surface preparation are desired.

Considerations shown in the table are as follows:

Slope.—The slope is more than 3 percent.

Flooding.—The map unit component is occasionally flooded or frequently flooded.

Wetness.—The map unit component is somewhat poorly drained, poorly drained, or very poorly drained or has a perched water table (any drainage class).

Surface boulders.—The word “bouldery” is in the map unit name.

Areas of rock outcrop.—The words “Rock outcrop” are in the map unit name.

Susceptible to rutting and wheel slippage (low strength).—The AASHTO classification is A-6, A-7, or A-8 in any layer at a depth of 20 inches or less.

Rubbly surface.—The word “rubbly” is in the map unit name.

Forest Land Site Preparation and Planting Considerations

Considerations shown in this table are as follows:

Slope.—The upper slope limit is more than 15 percent.

Flooding.—The map unit component is frequently flooded.

Wetness.—The map unit component is somewhat poorly drained, poorly drained, or very poorly drained or has a perched water table (any drainage class).

Depth to hard rock.—The depth to hard bedrock is less than 20 inches.

Surface stones.—The word “stony” is in the map unit name.

Surface boulders.—The word “bouldery” is in the map unit name.

Areas of rock outcrop.—The words “Rock outcrop” are in the map unit name.

Water erosion.—The slope is 8 percent or more.

Potential poor tilth and compaction.—The AASHTO classification is A-6 or A-7 in the upper 10 inches.

Rubbly surface.—The word “rubbly” is in the map unit name.

Cobbly surface.—The word “cobbly” is in the map unit name.

Forest Land Harvest Equipment Considerations

(Only the soils suitable for production of commercial trees are listed. See text for a description of the considerations listed in this table)

Map symbol and soil name	Forest land harvest equipment considerations
7A, 7B, 7C:	
Hubbard	Poor traction (loose sandy material)
38B, 38C2:	
Waukon	Susceptible to rutting and wheel slippage
38D2, 38E:	
Waukon	Slope Susceptible to rutting and wheel slippage
53B, 53C:	
Kandota	Susceptible to rutting and wheel slippage
53D:	
Kandota	Slope Susceptible to rutting and wheel slippage
121:	
Wykeham	Susceptible to rutting and wheel slippage
168B:	
Forman	Susceptible to rutting and wheel slippage
180:	
Gonvick	Susceptible to rutting and wheel slippage
191:	
Epoufette	Poor traction (loose sandy material) Wetness
202:	
Meehan	Poor traction (loose sandy material) Wetness
260:	
Duelm	Poor traction (loose sandy material)
267B, 267C:	
Snellman	Susceptible to rutting and wheel slippage
267E, 267F:	
Snellman	Slope Susceptible to rutting and wheel slippage
406A, 406B:	
Dorset	Susceptible to rutting and wheel slippage
422B, 422C:	
Bygland	Susceptible to rutting and wheel slippage
441A, 441B, 441C:	
Almora	Susceptible to rutting and wheel slippage
540:	
Seelyeville	Susceptible to rutting and wheel slippage Wetness
541:	
Rifle	Susceptible to rutting and wheel slippage Wetness

Forest Land Harvest Equipment Considerations--Continued

Map symbol and soil name	Forest land harvest equipment considerations
567A, 567B:	
Verndale	No major considerations or hazards
624:	
Rosy	Susceptible to rutting and wheel slippage
646C:	
Peever	Susceptible to rutting and wheel slippage
646D:	
Peever	Slope Susceptible to rutting and wheel slippage
670:	
Knute	Susceptible to rutting and wheel slippage
701:	
Runeberg	Susceptible to rutting and wheel slippage Wetness
705B, 705C:	
Nitche	Susceptible to rutting and wheel slippage
Kandota	Susceptible to rutting and wheel slippage
Lida	No major considerations or hazards
707B, 707C2:	
Lizzie	Susceptible to rutting and wheel slippage
707D2:	
Lizzie	Slope Susceptible to rutting and wheel slippage
710:	
Friberg	Susceptible to rutting and wheel slippage Wetness
Weetown	Susceptible to rutting and wheel slippage
715:	
Bluffcreek	Poor traction (loose sandy material)
Clearriver	Poor traction (loose sandy material)
716B, 716C:	
Leaflake	Poor traction (loose sandy material)
Eagleview	Poor traction (loose sandy material)
716D:	
Leaflake	Poor traction (loose sandy material) Slope
Eagleview	Poor traction (loose sandy material) Slope
718E:	
Naytahwaush	Slope Susceptible to rutting and wheel slippage
721B, 721C:	
Corliss	Poor traction (loose sandy material)

Forest Land Harvest Equipment Considerations--Continued

Map symbol and soil name	Forest land harvest equipment considerations
721D, 721E:	
Corliss	Poor traction (loose sandy material) Slope
760C2:	
Chapett	Susceptible to rutting and wheel slippage
Sisseton	Susceptible to rutting and wheel slippage
760D2:	
Chapett	Slope Susceptible to rutting and wheel slippage
Sisseton	Slope Susceptible to rutting and wheel slippage
769B:	
Mehurin	Susceptible to rutting and wheel slippage
776B, 776C:	
Snellman	Susceptible to rutting and wheel slippage
Sugarbush	Poor traction (loose sandy material)
776E:	
Snellman	Slope Susceptible to rutting and wheel slippage
Sugarbush	Poor traction (loose sandy material) Slope
778B, 778C:	
Dorset	Susceptible to rutting and wheel slippage
Corliss	Poor traction (loose sandy material)
779B:	
Peever	Susceptible to rutting and wheel slippage
Mehurin	Susceptible to rutting and wheel slippage
915C2:	
Forman	Susceptible to rutting and wheel slippage
Buse	Susceptible to rutting and wheel slippage
915D2:	
Forman	Slope Susceptible to rutting and wheel slippage
Buse	Slope Susceptible to rutting and wheel slippage
1102B, 1102C:	
Chapett	Susceptible to rutting and wheel slippage
Dorset	Susceptible to rutting and wheel slippage
1103:	
Clitherall	No major considerations or hazards

Forest Land Harvest Equipment Considerations--Continued

Map symbol and soil name	Forest land harvest equipment considerations
1104B, 1104C:	
Waukon	Susceptible to rutting and wheel slippage
Dorset	Susceptible to rutting and wheel slippage
1104D:	
Waukon	Slope Susceptible to rutting and wheel slippage
Dorset	Slope Susceptible to rutting and wheel slippage
1105B:	
Dent	Susceptible to rutting and wheel slippage
1111:	
Nidaros	Flooding Susceptible to rutting and wheel slippage Wetness
1112D, 1112E:	
Chapett	Slope Susceptible to rutting and wheel slippage
Corliss	Poor traction (loose sandy material) Slope
1120:	
Rushlake	Poor traction (loose sandy material)
Hangaard	Poor traction (loose sandy material) Wetness
1129:	
Lindaas	Susceptible to rutting and wheel slippage Wetness
1131B:	
Verndale	No major considerations or hazards
Abbeylake	Poor traction (loose sandy material)
1136:	
Nidaros	Susceptible to rutting and wheel slippage Wetness
1195A, 1195B, 1195C:	
Sybil	Poor traction (loose sandy material)
Eagleview	Poor traction (loose sandy material)
1195E:	
Sybil	Slope
Eagleview	Poor traction (loose sandy material) Slope
1196B:	
Lida	No major considerations or hazards
Two Inlets	No major considerations or hazards

Forest Land Harvest Equipment Considerations--Continued

Map symbol and soil name	Forest land harvest equipment considerations
1196C:	
Lida	No major considerations or hazards
Two Inlets	Poor traction (loose sandy material)
1196E, 1196F:	
Lida	Slope
Two Inlets	Poor traction (loose sandy material) Slope
1200:	
Egglake	Susceptible to rutting and wheel slippage Wetness
1208B:	
Naytahwaush	Susceptible to rutting and wheel slippage
Mahkonce	Susceptible to rutting and wheel slippage
1209C:	
Naytahwaush	Susceptible to rutting and wheel slippage
1212B:	
Mahkonce	Susceptible to rutting and wheel slippage
1215:	
Pinelake	Wetness
1216B:	
Egglake	Susceptible to rutting and wheel slippage Wetness
Wykeham	Susceptible to rutting and wheel slippage
1217E:	
Waukon	Slope Susceptible to rutting and wheel slippage
Lida	Slope
1218B, 1218C:	
Snellman	Susceptible to rutting and wheel slippage
Lida	No major considerations or hazards
1218E, 1218F:	
Snellman	Slope Susceptible to rutting and wheel slippage
Lida	Slope
1232B:	
Chapett	Susceptible to rutting and wheel slippage
1232E:	
Chapett	Slope Susceptible to rutting and wheel slippage

Forest Land Harvest Equipment Considerations--Continued

Map symbol and soil name	Forest land harvest equipment considerations
1247D:	
Corliss	Poor traction (loose sandy material) Slope
Dorset	Slope Susceptible to rutting and wheel slippage
1250C:	
Abbeylake	Poor traction (loose sandy material)
Verndale	No major considerations or hazards
1275B, 1275C:	
Kandota	Susceptible to rutting and wheel slippage
Egglake	Susceptible to rutting and wheel slippage Wetness
1276:	
Knute	Susceptible to rutting and wheel slippage
Brandsvold	Susceptible to rutting and wheel slippage Wetness
1277D:	
Corliss	Poor traction (loose sandy material) Slope
Sverdrup	Poor traction (loose sandy material) Slope
1289:	
Knute	Susceptible to rutting and wheel slippage
1290:	
Brandsvold	Susceptible to rutting and wheel slippage Wetness
1291:	
Sedgeville	Flooding Susceptible to rutting and wheel slippage Wetness
1307:	
Rushlake	Poor traction (loose sandy material)
1319B, 1319C:	
Rockwood	Poor traction (loose sandy material)
1319D:	
Rockwood	Poor traction (loose sandy material) Slope
1320B:	
Blowers	Wetness
1321:	
Paddock	Wetness
Becida	Susceptible to rutting and wheel slippage Wetness

Forest Land Harvest Equipment Considerations--Continued

Map symbol and soil name	Forest land harvest equipment considerations
1338:	
Oakcreek	No major considerations or hazards
1340:	
Bluffcreek	No major considerations or hazards
Epoufette	Poor traction (loose sandy material) Wetness
1341:	
Clitherall	No major considerations or hazards
Wykeham	Susceptible to rutting and wheel slippage
1342:	
Pinelake	Susceptible to rutting and wheel slippage Wetness
Brandsvold	Susceptible to rutting and wheel slippage Wetness
1343C:	
Lida	No major considerations or hazards
Almora	Susceptible to rutting and wheel slippage
Lizzie	Susceptible to rutting and wheel slippage
1344B:	
Lida	No major considerations or hazards
Almora	Susceptible to rutting and wheel slippage
Dent	Susceptible to rutting and wheel slippage
1345:	
Bluffcreek	Poor traction (loose sandy material)
Rosy	Susceptible to rutting and wheel slippage
1347B:	
Kandota	Susceptible to rutting and wheel slippage
1348:	
Knute	Susceptible to rutting and wheel slippage
1349:	
Clotho	Susceptible to rutting and wheel slippage Wetness
1350:	
Brandsvold	Susceptible to rutting and wheel slippage Wetness
1351:	
Bluffton	Susceptible to rutting and wheel slippage Wetness
1365:	
Hillview	Poor traction (loose sandy material) Wetness

Forest Land Harvest Equipment Considerations--Continued

Map symbol and soil name	Forest land harvest equipment considerations
1396:	
Sedgeville	Flooding Susceptible to rutting and wheel slippage Wetness
Nidaros	Susceptible to rutting and wheel slippage Wetness
Aquolls	Susceptible to rutting and wheel slippage Wetness
1397:	
Bemidji	Poor traction (loose sandy material)
1943:	
Roscommon	Poor traction (loose sandy material) Wetness
1975:	
Oylen	No major considerations or hazards

Forest Haul Road Considerations

(Only the soils suitable for production of commercial trees are listed. See text for a description of the considerations listed in this table)

Map symbol and soil name	Forest haul road considerations
7A, 7B:	
Hubbard	No major considerations or hazards
7C:	
Hubbard	Slope
38B:	
Waukon	Low bearing strength
38C2, 38D2, 38E:	
Waukon	Low bearing strength Slope
53B:	
Kandota	Low bearing strength
53C, 53D:	
Kandota	Low bearing strength Slope
121:	
Wykeham	Low bearing strength
168B:	
Forman	Low bearing strength
180:	
Gonvick	Low bearing strength
191:	
Epoufette	Wetness
202:	
Meehan	Wetness
260:	
Duelm	No major considerations or hazards
267B, 267C, 267E, 267F:	
Snellman	Low bearing strength Slope
406A, 406B:	
Dorset	Low bearing strength
422B:	
Bygland	Low bearing strength
422C:	
Bygland	Low bearing strength Slope
441A, 441B:	
Almora	Low bearing strength
441C:	
Almora	Low bearing strength Slope

Forest Haul Road Considerations--Continued

Map symbol and soil name	Forest haul road considerations
540:	
Seelyeville	Low bearing strength Wetness
541:	
Rifle	Low bearing strength Wetness
567A, 567B:	
Verndale	No major considerations or hazards
624:	
Rosy	Low bearing strength
646C, 646D:	
Peever	Low bearing strength Slope
670:	
Knute	Low bearing strength
701:	
Runeberg	Low bearing strength Wetness
705B:	
Nitche	Low bearing strength
Kandota	Low bearing strength
Lida	No major considerations or hazards
705C:	
Nitche	Low bearing strength Slope
Kandota	Low bearing strength Slope
Lida	Slope
707B:	
Lizzie	Low bearing strength
707C2, 707D2:	
Lizzie	Low bearing strength Slope
710:	
Friberg	Low bearing strength Wetness
Weetown	Low bearing strength
715:	
Bluffcreek	No major considerations or hazards
Clearriver	No major considerations or hazards
716B:	
Leaflake	No major considerations or hazards
Eagleview	No major considerations or hazards

Forest Haul Road Considerations--Continued

Map symbol and soil name	Forest haul road considerations
716C, 716D:	
Leaflake	Slope
Eagleview	Slope
718E:	
Naytahwaush	Low bearing strength Slope
721B:	
Corliss	No major considerations or hazards
721C, 721D, 721E:	
Corliss	Slope
760C2, 760D2:	
Chapett	Low bearing strength Slope
Sisseton	Low bearing strength Slope
769B:	
Mehurin	Low bearing strength
776B, 776C, 776E:	
Snellman	Low bearing strength Slope
Sugarbush	Slope
778B:	
Dorset	Low bearing strength
Corliss	No major considerations or hazards
778C:	
Dorset	Low bearing strength Slope
Corliss	Slope
779B:	
Peever	Low bearing strength
Mehurin	Low bearing strength
915C2, 915D2:	
Forman	Low bearing strength Slope
Buse	Low bearing strength Slope
1102B:	
Chapett	Low bearing strength
Dorset	Low bearing strength

Forest Haul Road Considerations--Continued

Map symbol and soil name	Forest haul road considerations
1102C:	
Chapett	Low bearing strength Slope
Dorset	Low bearing strength Slope
1103:	
Clitherall	No major considerations or hazards
1104B:	
Waukon	Low bearing strength
Dorset	Low bearing strength
1104C, 1104D:	
Waukon	Low bearing strength Slope
Dorset	Low bearing strength Slope
1105B:	
Dent	Low bearing strength
1111:	
Nidaros	Flooding Low bearing strength Wetness
1112D, 1112E:	
Chapett	Low bearing strength Slope
Corliss	Slope
1120:	
Rushlake	No major considerations or hazards
Hangaard	Wetness
1129:	
Lindaas	Low bearing strength Wetness
1131B:	
Verndale	No major considerations or hazards
Abbeylake	No major considerations or hazards
1136:	
Nidaros	Low bearing strength Wetness
1195A:	
Sybil	No major considerations or hazards
Eagleview	No major considerations or hazards
1195B, 1195C, 1195E:	
Sybil	Slope
Eagleview	Slope

Forest Haul Road Considerations--Continued

Map symbol and soil name	Forest haul road considerations
1196B, 1196C, 1196E, 1196F:	
Lida	Slope
Two Inlets	Slope
1200:	
Egglake	Low bearing strength Wetness
1208B:	
Naytahwaush	Low bearing strength Slope
Mahkonce	Low bearing strength
1209C:	
Naytahwaush	Low bearing strength Slope
1212B:	
Mahkonce	Low bearing strength
1215:	
Pinelake	Wetness
1216B:	
Egglake	Low bearing strength Wetness
Wykeham	Low bearing strength
1217E:	
Waukon	Low bearing strength Slope
Lida	Slope
1218B, 1218C, 1218E, 1218F:	
Snellman	Low bearing strength Slope
Lida	Slope
1232B:	
Chapett	Low bearing strength
1232E:	
Chapett	Low bearing strength Slope
1247D:	
Corliss	Slope
Dorset	Low bearing strength Slope
1250C:	
Abbeylake	Slope
Verndale	Slope

Forest Haul Road Considerations--Continued

Map symbol and soil name	Forest haul road considerations
1275B, 1275C:	
Kandota	Low bearing strength Slope
Egglake	Low bearing strength Wetness
1276:	
Knute	Low bearing strength
Brandsvold	Low bearing strength Wetness
1277D:	
Corliss	Slope
Sverdrup	Slope
1289:	
Knute	Low bearing strength
1290:	
Brandsvold	Low bearing strength Wetness
1291:	
Sedgeville	Flooding Low bearing strength Wetness
1307:	
Rushlake	No major considerations or hazards
1319B:	
Rockwood	No major considerations or hazards
1319C, 1319D:	
Rockwood	Slope
1320B:	
Blowers	Wetness
1321:	
Paddock	Wetness
Becida	Low bearing strength Wetness
1338:	
Oakcreek	No major considerations or hazards
1340:	
Bluffcreek	No major considerations or hazards
Epoufette	Wetness
1341:	
Clitherall	No major considerations or hazards
Wykeham	Low bearing strength

Forest Haul Road Considerations--Continued

Map symbol and soil name	Forest haul road considerations
1342:	
Pinelake	Low bearing strength Wetness
Brandsvold	Low bearing strength Wetness
1343C:	
Lida	Slope
Almora	Low bearing strength Slope
Lizzie	Low bearing strength Slope
1344B:	
Lida	Slope
Almora	Low bearing strength Slope
Dent	Low bearing strength
1345:	
Bluffcreek	No major considerations or hazards
Rosy	Low bearing strength
1347B:	
Kandota	Low bearing strength
1348:	
Knute	Low bearing strength
1349:	
Clotho	Low bearing strength Wetness
1350:	
Brandsvold	Low bearing strength Wetness
1351:	
Bluffton	Low bearing strength Wetness
1365:	
Hillview	Wetness
1396:	
Sedgeville	Flooding Low bearing strength Wetness
Nidaros	Low bearing strength Wetness
Aquolls	Low bearing strength Wetness

Forest Haul Road Considerations--Continued

Map symbol and soil name	Forest haul road considerations
1397:	
Bemidji	No major considerations or hazards
1943:	
Roscommon	Wetness
1975:	
Oylen	No major considerations or hazards

Forest Log Landing Considerations

(Only the soils suitable for production of commercial trees are listed. See text for a description of the considerations listed in this table)

Map symbol and soil name	Forest log landing considerations
7A:	
Hubbard	No major considerations or hazards
7B, 7C:	
Hubbard	Slope
38B, 38C2, 38D2, 38E:	
Waukon	Slope Susceptible to rutting and wheel slippage
53B, 53C, 53D:	
Kandota	Slope Susceptible to rutting and wheel slippage
121:	
Wykeham	Susceptible to rutting and wheel slippage
168B:	
Forman	Slope Susceptible to rutting and wheel slippage
180:	
Gonvick	Susceptible to rutting and wheel slippage
191:	
Epoufette	Wetness
202:	
Meehan	Wetness
260:	
Duelm	No major considerations or hazards
267B, 267C, 267E, 267F:	
Snellman	Slope Susceptible to rutting and wheel slippage
406A:	
Dorset	Susceptible to rutting and wheel slippage
406B:	
Dorset	Slope Susceptible to rutting and wheel slippage
422B, 422C:	
Bygland	Slope Susceptible to rutting and wheel slippage
441A:	
Almora	Susceptible to rutting and wheel slippage
441B, 441C:	
Almora	Slope Susceptible to rutting and wheel slippage
540:	
Seelyeville	Susceptible to rutting and wheel slippage Wetness

Forest Log Landing Considerations--Continued

Map symbol and soil name	Forest log landing considerations
541:	
Rifle	Susceptible to rutting and wheel slippage Wetness
567A:	
Verndale	No major considerations or hazards
567B:	
Verndale	Slope
624:	
Rosy	Susceptible to rutting and wheel slippage
646C, 646D:	
Peever	Slope Susceptible to rutting and wheel slippage
670:	
Knute	Susceptible to rutting and wheel slippage
701:	
Runeberg	Susceptible to rutting and wheel slippage Wetness
705B, 705C:	
Nitche	Slope Susceptible to rutting and wheel slippage
Kandota	Slope Susceptible to rutting and wheel slippage
Lida	Slope
707B, 707C2, 707D2:	
Lizzie	Slope Susceptible to rutting and wheel slippage
710:	
Friberg	Susceptible to rutting and wheel slippage Wetness
Weetown	Susceptible to rutting and wheel slippage
715:	
Bluffcreek	No major considerations or hazards
Clearriver	No major considerations or hazards
716B, 716C, 716D:	
Leaflake	Slope
Eagleview	Slope
718E:	
Naytahwaush	Slope Susceptible to rutting and wheel slippage
721B, 721C, 721D, 721E:	
Corliss	Slope

Forest Log Landing Considerations--Continued

Map symbol and soil name	Forest log landing considerations
760C2, 760D2:	
Chapett	Slope Susceptible to rutting and wheel slippage
Sisseton	Slope Susceptible to rutting and wheel slippage
769B:	
Mehurin	Slope Susceptible to rutting and wheel slippage
776B, 776C, 776E:	
Snellman	Slope Susceptible to rutting and wheel slippage
Sugarbush	Slope
778B, 778C:	
Dorset	Slope Susceptible to rutting and wheel slippage
Corliss	Slope
779B:	
Peever	Slope Susceptible to rutting and wheel slippage
Mehurin	Slope Susceptible to rutting and wheel slippage
915C2, 915D2:	
Forman	Slope Susceptible to rutting and wheel slippage
Buse	Slope Susceptible to rutting and wheel slippage
1102B, 1102C:	
Chapett	Slope Susceptible to rutting and wheel slippage
Dorset	Slope Susceptible to rutting and wheel slippage
1103:	
Clitherall	No major considerations or hazards
1104B, 1104C, 1104D:	
Waukon	Slope Susceptible to rutting and wheel slippage
Dorset	Slope Susceptible to rutting and wheel slippage
1105B:	
Dent	Slope Susceptible to rutting and wheel slippage
1111:	
Nidaros	Flooding Susceptible to rutting and wheel slippage Wetness

Forest Log Landing Considerations--Continued

Map symbol and soil name	Forest log landing considerations
1112D, 1112E:	
Chapett	Slope Susceptible to rutting and wheel slippage
Corliss	Slope
1120:	
Rushlake	No major considerations or hazards
Hangaard	Wetness
1129:	
Lindaas	Susceptible to rutting and wheel slippage Wetness
1131B:	
Verndale	Slope
Abbeylake	Slope
1136:	
Nidaros	Susceptible to rutting and wheel slippage Wetness
1195A:	
Sybil	No major considerations or hazards
Eagleview	No major considerations or hazards
1195B, 1195C, 1195E:	
Sybil	Slope
Eagleview	Slope
1196B, 1196C, 1196E, 1196F:	
Lida	Slope
Two Inlets	Slope
1200:	
Egglake	Susceptible to rutting and wheel slippage Wetness
1208B:	
Naytahwaush	Slope Susceptible to rutting and wheel slippage
Mahkonce	Slope Susceptible to rutting and wheel slippage
1209C:	
Naytahwaush	Slope Susceptible to rutting and wheel slippage
1212B:	
Mahkonce	Slope Susceptible to rutting and wheel slippage
1215:	
Pinelake	Wetness

Forest Log Landing Considerations--Continued

Map symbol and soil name	Forest log landing considerations
1216B:	
Egglake	Susceptible to rutting and wheel slippage Wetness
Wykeham	Slope Susceptible to rutting and wheel slippage
1217E:	
Waukon	Slope Susceptible to rutting and wheel slippage
Lida	Slope
1218B, 1218C, 1218E, 1218F:	
Snellman	Slope Susceptible to rutting and wheel slippage
Lida	Slope
1232B, 1232E:	
Chapett	Slope Susceptible to rutting and wheel slippage
1247D:	
Corliss	Slope
Dorset	Slope Susceptible to rutting and wheel slippage
1250C:	
Abbeylake	Slope
Verndale	Slope
1275B, 1275C:	
Kandota	Slope Susceptible to rutting and wheel slippage
Egglake	Susceptible to rutting and wheel slippage Wetness
1276:	
Knute	Susceptible to rutting and wheel slippage
Brandsvold	Susceptible to rutting and wheel slippage Wetness
1277D:	
Corliss	Slope
Sverdrup	Slope
1289:	
Knute	Susceptible to rutting and wheel slippage
1290:	
Brandsvold	Susceptible to rutting and wheel slippage Wetness

Forest Log Landing Considerations--Continued

Map symbol and soil name	Forest log landing considerations
1291:	
Sedgeville	Flooding Susceptible to rutting and wheel slippage Wetness
1307:	
Rushlake	No major considerations or hazards
1319B, 1319C, 1319D:	
Rockwood	Slope
1320B:	
Blowers	Slope Wetness
1321:	
Paddock	Wetness
Becida	Susceptible to rutting and wheel slippage Wetness
1338:	
Oakcreek	No major considerations or hazards
1340:	
Bluffcreek	No major considerations or hazards
Epoufette	Wetness
1341:	
Clitherall	No major considerations or hazards
Wykeham	Susceptible to rutting and wheel slippage
1342:	
Pinelake	Susceptible to rutting and wheel slippage Wetness
Brandsvold	Susceptible to rutting and wheel slippage Wetness
1343C:	
Lida	Slope
Almora	Slope Susceptible to rutting and wheel slippage
Lizzie	Slope Susceptible to rutting and wheel slippage
1344B:	
Lida	Slope
Almora	Slope Susceptible to rutting and wheel slippage
Dent	Slope Susceptible to rutting and wheel slippage
1345:	
Bluffcreek	No major considerations or hazards
Rosy	Susceptible to rutting and wheel slippage

Forest Log Landing Considerations--Continued

Map symbol and soil name	Forest log landing considerations
1347B:	
Kandota	Slope Susceptible to rutting and wheel slippage
1348:	
Knute	Susceptible to rutting and wheel slippage
1349:	
Clotho	Susceptible to rutting and wheel slippage Wetness
1350:	
Brandsvold	Susceptible to rutting and wheel slippage Wetness
1351:	
Bluffton	Susceptible to rutting and wheel slippage Wetness
1365:	
Hillview	Wetness
1396:	
Sedgeville	Flooding Susceptible to rutting and wheel slippage Wetness
Nidaros	Susceptible to rutting and wheel slippage Wetness
Aquolls	Susceptible to rutting and wheel slippage Wetness
1397:	
Bemidji	No major considerations or hazards
1943:	
Roscommon	Wetness
1975:	
Oylen	No major considerations or hazards

Forest Land Site Preparation and Planting Considerations

(Only the soils suitable for production of commercial trees are listed. See text for a description of the considerations listed in this table)

Map symbol and soil name	Site preparation and planting considerations
7A, 7B:	
Hubbard	No major considerations or hazards
7C:	
Hubbard	Water erosion
38B:	
Waukon	Potential poor tilth and compaction
38C2:	
Waukon	Potential poor tilth and compaction Water erosion
38D2, 38E:	
Waukon	Potential poor tilth and compaction Slope Water erosion
53B:	
Kandota	Potential poor tilth and compaction
53C:	
Kandota	Potential poor tilth and compaction Water erosion
53D:	
Kandota	Potential poor tilth and compaction Slope Water erosion
121:	
Wykeham	No major considerations or hazards
168B:	
Forman	Potential poor tilth and compaction
180:	
Gonvick	No major considerations or hazards
191:	
Epoufette	Wetness
202:	
Meehan	Wetness
260:	
Duelm	No major considerations or hazards
267B, 267C:	
Snellman	Water erosion
267E, 267F:	
Snellman	Slope Water erosion
406A, 406B:	
Dorset	No major considerations or hazards
422B:	
Bygland	Potential poor tilth and compaction

Forest Land Site Preparation and Planting Considerations--Continued

Map symbol and soil name	Site preparation and planting considerations
422C:	
Bygland	Potential poor tilth and compaction Water erosion
441A, 441B:	
Almora	No major considerations or hazards
441C:	
Almora	Water erosion
540:	
Seelyeville	Wetness
541:	
Rifle	Wetness
567A, 567B:	
Verndale	No major considerations or hazards
624:	
Rosy	No major considerations or hazards
646C:	
Peever	Potential poor tilth and compaction Water erosion
646D:	
Peever	Potential poor tilth and compaction Slope Water erosion
670:	
Knute	No major considerations or hazards
701:	
Runeberg	Potential poor tilth and compaction Wetness
705B:	
Nitche	No major considerations or hazards
Kandota	Potential poor tilth and compaction
Lida	No major considerations or hazards
705C:	
Nitche	Water erosion
Kandota	Potential poor tilth and compaction Water erosion
Lida	Water erosion
707B:	
Lizzie	Potential poor tilth and compaction
707C2:	
Lizzie	Potential poor tilth and compaction Water erosion
707D2:	
Lizzie	Potential poor tilth and compaction Slope Water erosion

Forest Land Site Preparation and Planting Considerations--Continued

Map symbol and soil name	Site preparation and planting considerations
710:	
Friberg	Wetness
Weetown	No major considerations or hazards
715:	
Bluffcreek	No major considerations or hazards
Clearriver	No major considerations or hazards
716B:	
Leaflake	No major considerations or hazards
Eagleview	No major considerations or hazards
716C:	
Leaflake	Water erosion
Eagleview	Water erosion
716D:	
Leaflake	Slope Water erosion
Eagleview	Slope Water erosion
718E:	
Naytahwaush	Potential poor tilth and compaction Slope Water erosion
721B:	
Corliss	No major considerations or hazards
721C:	
Corliss	Water erosion
721D, 721E:	
Corliss	Slope Water erosion
760C2:	
Chapett	Potential poor tilth and compaction Water erosion
Sisseton	Potential poor tilth and compaction Water erosion
760D2:	
Chapett	Potential poor tilth and compaction Slope Water erosion
Sisseton	Potential poor tilth and compaction Slope Water erosion
769B:	
Mehurin	No major considerations or hazards

Forest Land Site Preparation and Planting Considerations--Continued

Map symbol and soil name	Site preparation and planting considerations
776B, 776C:	
Snellman	Water erosion
Sugarbush	Water erosion
776E:	
Snellman	Slope Water erosion
Sugarbush	Slope Water erosion
778B:	
Dorset	No major considerations or hazards
Corliss	No major considerations or hazards
778C:	
Dorset	Water erosion
Corliss	Water erosion
779B:	
Peever	No major considerations or hazards
Mehurin	No major considerations or hazards
915C2:	
Forman	Potential poor tilth and compaction Water erosion
Buse	Potential poor tilth and compaction Water erosion
915D2:	
Forman	Potential poor tilth and compaction Slope Water erosion
Buse	Potential poor tilth and compaction Slope Water erosion
1102B:	
Chapett	Potential poor tilth and compaction
Dorset	No major considerations or hazards
1102C:	
Chapett	Potential poor tilth and compaction Water erosion
Dorset	Water erosion
1103:	
Clitherall	No major considerations or hazards
1104B:	
Waukon	Potential poor tilth and compaction
Dorset	No major considerations or hazards

Forest Land Site Preparation and Planting Considerations--Continued

Map symbol and soil name	Site preparation and planting considerations
1104C:	
Waukon	Potential poor tilth and compaction Water erosion
Dorset	Water erosion
1104D:	
Waukon	Potential poor tilth and compaction Slope Water erosion
Dorset	Slope Water erosion
1105B:	
Dent	No major considerations or hazards
1111:	
Nidaros	Flooding Wetness
1112D, 1112E:	
Chapett	Potential poor tilth and compaction Slope Water erosion
Corliss	Slope Water erosion
1120:	
Rushlake	No major considerations or hazards
Hangaard	Wetness
1129:	
Lindaas	Wetness
1131B:	
Verndale	No major considerations or hazards
Abbeylake	No major considerations or hazards
1136:	
Nidaros	Wetness
1195A:	
Sybil	No major considerations or hazards
Eagleview	No major considerations or hazards
1195B, 1195C:	
Sybil	Water erosion
Eagleview	Water erosion
1195E:	
Sybil	Slope Water erosion
Eagleview	Slope Water erosion

Forest Land Site Preparation and Planting Considerations--Continued

Map symbol and soil name	Site preparation and planting considerations
1196B, 1196C:	
Lida	Water erosion
Two Inlets	Water erosion
1196E, 1196F:	
Lida	Slope Water erosion
Two Inlets	Slope Water erosion
1200:	
Egglake	Wetness
1208B:	
Naytahwaush	Potential poor tilth and compaction Water erosion
Mahkonce	Potential poor tilth and compaction
1209C:	
Naytahwaush	Potential poor tilth and compaction Water erosion
1212B:	
Mahkonce	Potential poor tilth and compaction
1215:	
Pinelake	Wetness
1216B:	
Egglake	Wetness
Wykeham	No major considerations or hazards
1217E:	
Waukon	Potential poor tilth and compaction Slope Water erosion
Lida	Slope Water erosion
1218B, 1218C:	
Snellman	Water erosion
Lida	Water erosion
1218E, 1218F:	
Snellman	Slope Water erosion
Lida	Slope Water erosion
1232B:	
Chapett	Potential poor tilth and compaction
1232E:	
Chapett	Potential poor tilth and compaction Slope Water erosion

Forest Land Site Preparation and Planting Considerations--Continued

Map symbol and soil name	Site preparation and planting considerations
1247D:	
Corliss	Slope Water erosion
Dorset	Slope Water erosion
1250C:	
Abbeylake	Water erosion
Verndale	Water erosion
1275B, 1275C:	
Kandota	Potential poor tilth and compaction Water erosion
Egglake	Potential poor tilth and compaction Wetness
1276:	
Knute	No major considerations or hazards
Brandsvold	Wetness
1277D:	
Corliss	Slope Water erosion
Sverdrup	Slope Water erosion
1289:	
Knute	No major considerations or hazards
1290:	
Brandsvold	Wetness
1291:	
Sedgeville	Flooding Potential poor tilth and compaction Wetness
1307:	
Rushlake	No major considerations or hazards
1319B:	
Rockwood	Surface stones
1319C:	
Rockwood	Surface stones Water erosion
1319D:	
Rockwood	Slope Surface stones Water erosion
1320B:	
Blowers	Surface stones Wetness

Forest Land Site Preparation and Planting Considerations--Continued

Map symbol and soil name	Site preparation and planting considerations
1321:	
Paddock	Surface stones Wetness
Becida	Potential poor tilth and compaction Surface stones Wetness
1338:	
Oakcreek	No major considerations or hazards
1340:	
Bluffcreek	No major considerations or hazards
Epoufette	Wetness
1341:	
Clitherall	No major considerations or hazards
Wykeham	No major considerations or hazards
1342:	
Pinelake	Wetness
Brandsvold	Potential poor tilth and compaction Wetness
1343C:	
Lida	Water erosion
Almora	Water erosion
Lizzie	Water erosion
1344B:	
Lida	Water erosion
Almora	Water erosion
Dent	No major considerations or hazards
1345:	
Bluffcreek	No major considerations or hazards
Rosy	No major considerations or hazards
1347B:	
Kandota	Potential poor tilth and compaction
1348:	
Knute	No major considerations or hazards
1349:	
Clotho	Wetness
1350:	
Brandsvold	Wetness
1351:	
Bluffton	Potential poor tilth and compaction Wetness

Forest Land Site Preparation and Planting Considerations--Continued

Map symbol and soil name	Site preparation and planting considerations
1365:	
Hillview	Wetness
1396:	
Sedgeville	Flooding Potential poor tilth and compaction Wetness
Nidaros	Wetness
Aquolls	Potential poor tilth and compaction Wetness
1397:	
Bemidji	No major considerations or hazards
1943:	
Roscommon	Wetness
1975:	
Oylen	No major considerations or hazards

Recreation

Otter Tail County offers a variety of recreational opportunities. Camping, canoeing, boating, hunting, fishing, horseback riding, golfing, bicycling, cross-country skiing, snowmobiling, and swimming are most common. Most of the major recreational areas in the county are associated with the many lakes. There are more than 1,000 lakes in the county. Most of the popular lakes have public access points, and most have boat launching ramps. Some lake access points are privately controlled. Glendalough State Park, Inspiration Peak State Park, and Maplewood State Park offer camping, scenic hiking, horseback riding trails, swimming, and fishing. Phelps Mill is known for its picnicking areas and cultural value. Inspiration Peak is the second highest point in Minnesota. An area called Seven Sisters Prairie abruptly rises 200 feet above the north shore of Lake Christina along the Otter Tail County and Douglas County line. This landform feature supports an unusual number of distinctly different western plants not commonly found in Minnesota. Also, there are numerous city and county parks throughout the county. The Otter Tail River provides scenic canoeing and tubing opportunities along its course. The many waterfowl production areas and wildlife management areas are open to public hunting. Information on additional recreational opportunities can be obtained at the Fergus Falls Chamber of Commerce or the tourist information centers in Battle Lake, Perham, and other area communities.

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

Camp areas are tracts of land used intensively as sites for tents, trailers, and campers and for outdoor activities that accompany such sites (fig. 25). These 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 soils are rated on the basis of soil properties that influence the ease of developing camp areas and performance of the areas after development. Also considered are the soil properties that influence trafficability and promote the growth of vegetation after heavy use.

Picnic areas are natural or landscaped tracts of land that are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation after development. The surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Playgrounds are areas used intensively for baseball, football, or similar activities. These areas require a nearly level soil that is free of stones and that can withstand heavy foot traffic and maintain an adequate cover of vegetation. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation. Slope and stoniness are the main concerns in developing playgrounds. The surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Paths and trails are areas used for hiking and horseback riding. The areas should require little or no cutting and filling during site preparation. The soils are rated on the basis of soil properties that influence trafficability and erodibility. Paths and trails should remain firm under foot traffic and not be dusty when dry.

Golf fairways are subject to heavy foot traffic and

Figure 25.—A campground in an area of Rushlake-Hangaard complex. Areas of these soils are commonly developed as homesites or campgrounds.

some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

The interpretive ratings in this table help engineers, planners, and others to understand how soil properties influence recreational uses. Ratings for proposed uses are given in terms of limitations. Only the most restrictive features are listed. Other features may limit a specific recreational use.

The degree of soil limitation is expressed as slight, moderate, or severe.

Slight means that soil properties are favorable for the rated use. The limitations are minor and can be easily overcome. Good performance and low maintenance are expected.

Moderate means that soil properties are moderately favorable for the rated use. The limitations can be overcome or modified by special planning, design, or maintenance. During some part of the year, the expected performance may be less desirable than that of soils rated *slight*.

Severe means that soil properties are unfavorable for the rated use. Examples of limitations are slope, bedrock near the surface, flooding, and a seasonal high water table. These limitations generally require major soil reclamation, special design, or intensive

maintenance. Overcoming the limitations generally is difficult and costly.

The information in the table “Recreational Development” can be supplemented by other information in this survey, for example, interpretations for dwellings without basements and for local roads and streets in the table “Building Site Development” and interpretations for septic tank absorption fields in the table “Sanitary Facilities.”

Recreational Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
7A:					
Hubbard	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: droughty.
7B:					
Hubbard	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
7C:					
Hubbard	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
26:					
Aazdahl	Slight	Slight	Slight	Slight	Slight.
34:					
Parnell	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
38B:					
Waukon	Slight	Slight	Moderate: slope.	Slight	Slight.
38C2:					
Waukon	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
38D2:					
Waukon	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
38E:					
Waukon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
46:					
Borup	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
53B:					
Kandota	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
53C:					
Kandota	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
53D:					
Kandota	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
58:					
Kittson	Slight	Slight	Slight	Slight	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
59:					
Grimstad	Slight	Slight	Slight	Slight	Slight.
61:					
Arveson	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
63:					
Rockwell	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
65:					
Foxhome	Slight	Slight	Slight	Slight	Slight.
66:					
Flaming	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: droughty.
68:					
Arveson	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
107:					
Winger	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
108:					
McIntosh	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
121:					
Wykeham	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
127A:					
Sverdrup	Slight	Slight	Slight	Slight	Moderate: droughty.
127B:					
Sverdrup	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
127C:					
Sverdrup	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
141B:					
Egeland	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
141C:					
Egeland	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
141D:					
Egeland	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
168B:					
Forman	Slight	Slight	Moderate: slope.	Slight	Slight.
180:					
Gonvick	Slight	Slight	Moderate: slope.	Slight	Slight.
184:					
Hamerly	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
187:					
Haug	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
191:					
Epoufette	Severe: wetness.	Severe: wetness.	Severe: small stones, wetness.	Severe: wetness.	Severe: wetness.
202:					
Meehan	Severe: wetness, too acid.	Severe: too acid.	Severe: wetness, too acid.	Moderate: wetness, too sandy.	Severe: too acid.
258A, 258B:					
Sandberg	Moderate: droughty.	Moderate: droughty.	Severe: small stones.	Slight	Severe: droughty.
258C:					
Sandberg	Moderate: slope.	Moderate: slope.	Severe: slope, small stones.	Slight	Severe: droughty.
260:					
Duelm	Slight	Slight	Moderate: small stones, wetness.	Slight	Moderate: droughty.
267B:					
Snellman	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
267C:					
Snellman	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
267E:					
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
267F:					
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
290:					
Rothsay	Slight	Slight	Moderate: slope.	Slight	Slight.
293B:					
Swenoda	Slight	Slight	Moderate: slope.	Slight	Slight.
335:					
Urness	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
339:					
Fordville	Slight	Slight	Slight	Slight	Slight.
341A:					
Arvilla	Slight	Slight	Slight	Slight	Moderate: droughty.
341B:					
Arvilla	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
371:					
Clontarf	Slight	Slight	Slight	Slight	Moderate: droughty.
375:					
Forada	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
402C:					
Sioux	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Severe: droughty.
402E:					
Sioux	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
406A:					
Dorset	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
406B:					
Dorset	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
418:					
Lamoure	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
422B:					
Bygland	Slight	Slight	Moderate: slope.	Slight	Slight.
422C:					
Bygland	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
426:					
Foldahl	Slight	Slight	Slight	Slight	Moderate: droughty.
441A:					
Almora	Slight	Slight	Moderate: small stones.	Slight	Slight.
441B:					
Almora	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
441C:					
Almora	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
481:					
Kratka	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
494:					
Darnen	Slight	Slight	Slight	Slight	Slight.
497:					
Hantho	Slight	Slight	Moderate: slope.	Slight	Slight.
508:					
Wyndmere	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
540:					
Seelyeville	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
541:					
Rifle	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
544:					
Cathro	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
567A:					
Verndale	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
567B:					
Verndale	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
609B:					
Dickey	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
624:					
Rosy	Slight	Slight	Slight	Slight	Slight.
646C:					
Peever	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
646D:					
Peever	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
670:					
Knute	Slight	Slight	Moderate: small stones.	Slight	Slight.
680:					
Parnell	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
698:					
Doran	Slight	Slight	Slight	Slight	Slight.
701:					
Runeberg	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
705B:					
Nitche	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
Kandota	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Lida	Slight	Slight	Moderate: slope.	Slight	Moderate: large stones, droughty.
705C:					
Nitche	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Kandota	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Lida	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
707B:					
Lizzie	Slight	Slight	Moderate: slope.	Slight	Slight.
707C2:					
Lizzie	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
707D2:					
Lizzie	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
710:					
Friberg	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Weetown	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
711B:					
Arvilla	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Sandberg	Moderate: droughty.	Moderate: droughty.	Severe: small stones.	Slight	Moderate: small stones, droughty.
711C:					
Arvilla	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Sandberg	Moderate: slope.	Moderate: slope.	Severe: slope, small stones.	Slight	Moderate: small stones, droughty.
715:					
Bluffcreek	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
Clearriver	Moderate: too sandy.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Severe: droughty.
716B:					
Leaflake	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
Eagleview	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Moderate: droughty.
716C:					
Leaflake	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
Eagleview	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
716D:					
Leaflake	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
Eagleview	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
718E:					
Naytahwaush	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
721B:					
Corliss	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Severe: droughty.
721C:					
Corliss	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Severe: droughty.
721D:					
Corliss	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: droughty, slope.
721E:					
Corliss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
726:					
Kratka	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
746:					
Haslie	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
760C2:					
Chapett	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Sisseton	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
760D2:					
Chapett	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Sisseton	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
769B:					
Mehurin	Slight	Slight	Moderate: slope.	Slight	Slight.
776B:					
Snellman	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
Sugarbush	Slight	Slight	Moderate: slope.	Slight	Moderate: large stones, droughty.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
776C:					
Snellman	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
Sugarbush	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
776E:					
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Sugarbush	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
777C2:					
Sisseton	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Heimdal	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
777D2:					
Sisseton	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Heimdal	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
777E:					
Sisseton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Heimdal	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
778B:					
Dorset	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
Corliss	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Severe: droughty.
778C:					
Dorset	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Corliss	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Severe: droughty.
779B:					
Peever	Slight	Slight	Moderate: slope.	Slight	Slight.
Mehurin	Slight	Slight	Moderate: slope.	Slight	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
902B:					
Barnes	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Buse	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
903C2:					
Barnes	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Langhei	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
915C2:					
Forman	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Buse	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
915D2:					
Forman	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Buse	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
931C2:					
Formdale	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Langhei	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
931D2:					
Formdale	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
942D2:					
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Barnes	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
957B2:					
Rothsay	Slight	Slight	Moderate: slope.	Slight	Slight.
Zell	Slight	Slight	Moderate: slope.	Slight	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
969C2:					
Zell	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Rothsay	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
969D2:					
Zell	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Rothsay	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1015:					
Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
1016:					
Udorthents	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1027:					
Udorthents.					
1030:					
Pits.					
Udipsamments	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.	Severe: slope.
1077:					
Forada	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Leafriver	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
1102B:					
Chapett	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Dorset	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
1102C:					
Chapett	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Dorset	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
1103:					
Clitherall	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1104B:					
Waukon	Slight	Slight	Moderate: slope.	Slight	Slight.
Dorset	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
1104C:					
Waukon	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Dorset	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
1104D:					
Waukon	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Dorset	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1105B:					
Dent	Slight	Slight	Moderate: slope.	Slight	Slight.
1110:					
Isan	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1111:					
Nidaros	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: ponding, flooding, excess humus.
1112D:					
Chapett	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Corliss	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: droughty, slope.
1112E:					
Chapett	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Corliss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
1113:					
Haslie	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Seelyeville	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1113:					
Cathro	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
1114:					
Hangaard	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
1120:					
Rushlake	Moderate: too sandy.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Severe: droughty.
Hangaard	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
1129:					
Lindaas	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
1131B:					
Verndale	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
Abbeylake	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Severe: droughty.
1136:					
Nidaros	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
1149:					
Hamerly	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
1195A:					
Sybil	Slight	Slight	Slight	Slight	Moderate: droughty.
Eagleview	Moderate: too sandy.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
1195B:					
Sybil	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Eagleview	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Moderate: droughty.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1195C:					
Sybil	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Eagleview	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
1195E:					
Sybil	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Eagleview	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
1196B:					
Lida	Slight	Slight	Moderate: slope.	Slight	Moderate: large stones, droughty.
Two Inlets	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, droughty, slope.
1196C:					
Lida	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
Two Inlets	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, droughty, slope.
1196E:					
Lida	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Two Inlets	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
1196F:					
Lida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Two Inlets	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
1200:					
Egglake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1208B:					
Naytahwaush	Slight	Slight	Severe: slope.	Slight	Slight.
Mahkonce	Slight	Slight	Moderate: slope.	Slight	Slight.
1209C:					
Naytahwaush	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
1212B:					
Mahkonce	Slight	Slight	Moderate: slope.	Slight	Slight.
1214:					
Mustinka	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1215:					
Pinelake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1216B:					
Egglake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Wykeham	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
1217E:					
Waukon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1218B:					
Snellman	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
Lida	Slight	Slight	Moderate: slope.	Slight	Moderate: large stones, droughty.
1218C:					
Snellman	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
Lida	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
1218E:					
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Lida	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1218F:					
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lida	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1219C:					
Sandberg	Moderate: slope.	Moderate: slope.	Severe: slope, small stones.	Slight	Moderate: small stones, droughty.
Sverdrup	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
1221B:					
Sverdrup	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Sandberg	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, droughty.
1223D:					
Sandberg	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Arvilla	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1227:					
Quam	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Cathro	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Urness	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
1230:					
Haslie	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Nidaros	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
1232B:					
Chapett	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
1232E:					
Chapett	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1234B:					
Formdale	Slight	Slight	Moderate: slope.	Slight	Slight.
Buse	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
1237:					
Lakepark	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1239:					
Quam	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
1240:					
Roliss	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1247D:					
Corliss	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: droughty, slope.
Dorset	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1250C:					
Abbeylake	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Severe: droughty.
Verndale	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
1259:					
Hamerly	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Mustinka	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1275B:					
Kandota	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Egglake	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
1275C:					
Kandota	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Egglake	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1276:					
Knute	Slight	Slight	Moderate: small stones.	Slight	Slight.
Brandsvold	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1277D:					
Corliss	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: droughty, slope.
Sverdrup	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1289:					
Knute	Slight	Slight	Moderate: small stones.	Slight	Slight.
1290:					
Brandsvold	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1291:					
Sedgeville	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
1293:					
Sedgeville	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1304A:					
Glyndon	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
1307:					
Rushlake	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
1317:					
Vallers	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1319B:					
Rockwood	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
1319C:					
Rockwood	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
1319D:					
Rockwood	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1320B:					
Blowers	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1321:					
Paddock	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: large stones, wetness.
Becida	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1322:					
Wolverton	Slight	Slight	Slight	Slight	Slight.
1324B:					
Heimdal	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Sisseton	Slight	Slight	Moderate: slope.	Slight	Slight.
1338:					
Oakcreek	Slight	Slight	Moderate: small stones.	Slight	Slight.
1339:					
Borup	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
1340:					
Bluffcreek	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
Epoufette	Severe: wetness.	Severe: wetness.	Severe: small stones, wetness.	Severe: wetness.	Severe: wetness.
1341:					
Clitherall	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
Wykeham	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
1342:					
Pinelake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Brandsvold	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1343C:					
Lida	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
Almora	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Lizzie	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1344B:					
Lida	Slight	Slight	Moderate: slope.	Slight	Moderate: large stones, droughty.
Almora	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Dent	Slight	Slight	Moderate: slope.	Slight	Slight.
1345:					
Bluffcreek	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
Rosy	Slight	Slight	Slight	Slight	Slight.
1346:					
Nidaros	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
1347B:					
Kandota	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
1348:					
Knute	Slight	Slight	Moderate: small stones.	Slight	Slight.
1349:					
Clotho	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1350:					
Brandsvold	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1351:					
Bluffton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
1365:					
Hillview	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1396:					
Sedgeville	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
Nidaros	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Aquolls	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1397:					
Bemidji	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
1825B:					
Seelyeville	Severe: wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness.	Severe: wetness, excess humus.	Severe: wetness, excess humus.
1874:					
Radium	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Severe: droughty.
1943:					
Roscommon	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1975:					
Oylen	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.

Wildlife Habitat

The diverse geological and soil features in Otter Tail County can provide diverse habitat for a variety of wildlife species when managed effectively. The kind and abundance of wildlife are dependent upon the amounts and distribution of food, cover, and water. Changes in land use patterns can have a direct influence on the population of wildlife species. Wildlife habitat can be created or improved by planting desirable vegetation, maintaining existing plant cover, or promoting the natural regeneration of vegetation. Knowledge of soil hazards and limitations is helpful in developing, managing, and protecting wildlife areas.

Throughout the county are wildlife management areas, waterfowl production areas, and game refuges that are managed and administered by the Minnesota Department of Natural Resources or the U.S. Fish and Wildlife Service.

Areas of soils that formed in glacial till and glaciolacustrine sediments under prairie vegetation are dominantly used as cropland but include small to large wetlands. These wetland areas provide waterfowl nesting areas and are used during the fall waterfowl migration. The wetlands and adjacent areas provide the habitat elements for upland game birds and other wildlife species. Wetland areas that support cattails and willows provide winter protection for upland game birds that may nest nearby. Because of the intense agricultural usage in this part of the county, additional food plots and habitat may be needed. Some of the common game species in the wildlife management areas, waterfowl production areas, and game refuges are ducks, geese, ring-necked pheasants, prairie chickens, Hungarian partridge, and white-tailed deer.

Areas of soils that formed in outwash under dominantly prairie vegetation are primarily used as cropland but include scattered small woodlots in conjunction with small marshes and wet depressions. These areas are well suited to waterfowl, upland game birds, and game animals, such as ducks, geese, ring-necked pheasants, Hungarian partridge, fox, rabbits, squirrels, and white-tailed deer. The wetlands provide nesting areas and protection for waterfowl, and the adjacent cropland and wooded areas provide food.

Soils that formed under dominantly forest vegetation on gently rolling to steep moraines, till plains, and outwash plains are currently about 35 percent forested. The forested areas provide habitat for such wildlife species as white-tailed deer, black bear, squirrels, ruffed grouse, and rabbits. Wild turkeys have recently been introduced into some of the larger forested areas in the south-central part of the county. Wetlands in these areas provide habitat for furbearers and various types of waterfowl, such as small flocks of mallards or wood ducks (fig. 26).

Generally, in the eastern two-thirds of the county, beaver have become a problem by blocking culverts, small streams, and drainage ditches. These blockages result in water backing over roads and farm fields.

In the eastern half of the county there have been sightings of bald eagles and some moose, coyotes, and timberwolves.

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. If food, cover, or water is missing, inadequate, or inaccessible, wildlife will be scarce or will not inhabit the area.

If the soils have potential for habitat development, wildlife habitat can be created or improved by planting appropriate vegetation, properly managing the existing plant cover, and fostering the natural establishment of desirable plants.

Elements of Wildlife Habitat

The elements of wildlife habitat are described in the following paragraphs (see "Wildlife Habitat" table).

Grain and seed crops are domestic grains and seed-producing herbaceous plants used by wildlife. Examples are corn, soybeans, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes planted for wildlife food and cover. Examples are bromegrass, timothy, orchardgrass, clover, alfalfa, wheatgrass, and birdsfoot trefoil.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Examples are

Figure 26.—An area of Haslie and Nidaros soils, ponded, provides good habitat for waterfowl, furbearers, and other wetland species.

bluestems, indiangrass, blueberry, goldenrod, lambsquarters, dandelions, blackberry, ragweed, wheatgrass, and nightshade.

The major soil properties affecting the growth of grain and forage crops and wild herbaceous plants are depth of the root zone, texture of the surface layer, the amount of water available to plants, wetness, salinity, and flooding. The length of the growing season also is important.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage that wildlife eat. Examples are oak, poplar, box elder, birch, maple, green ash, willow, and American elm.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Examples of fruit-producing shrubs that are suitable for planting on soils that have good potential for these plants are hawthorn, honeysuckle, American plum, redosier dogwood, chokecherry, serviceberry, silver buffaloberry, and crabapple.

Coniferous plants are cone-bearing trees, shrubs,

and ground cover that provide habitat or supply food in the form of browse, seed, or fruit-like cones. Examples are pine, spruce, cedar, and tamarack.

The major soil properties affecting the growth of hardwood and coniferous trees and shrubs are depth of the root zone, the amount of water available to plants, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded.

Wetland plants produce food or cover for wetland wildlife. Examples of these plants are smartweeds, wild millet, rushes, sedges, bulrushes, wild rice, arrowhead, waterplantain, cattail, prairie cordgrass, bluejoint grass, asters, and beggarticks.

The major soil properties affecting wetland plants are texture of the surface layer, wetness, acidity or alkalinity, and slope.

Shallow water areas have an average depth of less than 5 feet. They are useful as habitat for some wildlife species. They are naturally wet areas or are created by dams, levees, or water-control measures in marshes or streams. Examples are waterfowl feeding areas, wildlife watering developments, beaver ponds, and other wildlife ponds.

The major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability.

Kinds of Wildlife Habitat

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, and shrubs. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include Hungarian partridge, ring-necked pheasant, sharp-tailed grouse, meadowlark, field sparrow, killdeer, cottontail rabbit, and red fox.

Habitat for woodland wildlife consists of areas of hardwoods or conifers or a mixture of these and associated grasses, legumes, and wild herbaceous plants. The wildlife attracted to this habitat include wild turkey, ruffed grouse, thrushes, woodpeckers, owls, tree squirrels, porcupine, raccoon, white-tailed deer, black bear, and moose.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas, bogs, or flood plains that support water-tolerant plants. The wildlife attracted to this habitat include ducks, geese, herons, bitterns, rails, kingfishers, muskrat, otter, mink, and beaver.

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 soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
7A, 7B:											
Hubbard	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
7C:											
Hubbard	Very poor.	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
26:											
Aazdahl	Good	Good	Good	Good	Good	---	Poor	Fair	Good	Fair	Poor.
34:											
Parnell	Fair	Fair	Poor	Poor	Very poor.	Poor	Good	Good	Fair	Poor	Good.
38B, 38C2:											
Waukon	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
38D2:											
Waukon	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
38E:											
Waukon	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
46:											
Borup	Fair	Fair	Fair	Fair	Poor	Fair	Good	Good	Fair	Fair	Good.
53B:											
Kandota	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
53C:											
Kandota	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
53D:											
Kandota	Poor	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
58:											
Kittson	Good	Good	Good	Fair	Fair	Good	Fair	Poor	Good	Fair	Fair.
59:											
Grimstad	Fair	Good	Fair	Fair	Fair	---	Fair	Fair	Fair	Fair	Fair.
61:											
Arveson	Good	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
63:											
Rockwell	Fair	Fair	Good	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
65:											
Foxhome	Good	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
66:											
Flaming	Fair	Fair	Good	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Fair.
68:											
Arveson	Fair	Fair	Poor	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
107:											
Winger	Good	Good	Fair	Fair	Fair	Good	Good	Good	Good	Fair	Good.
108:											
McIntosh	Good	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
121:											
Wykeham	Good	Good	Good	Good	Fair	Good	Poor	Poor	Good	Good	Poor.
127A, 127B:											
Sverdrup	Fair	Fair	Fair	Fair	Fair	---	Poor	Very poor.	Fair	Fair	Poor.
127C:											
Sverdrup	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
141B:											
Egeland	Fair	Fair	Good	Fair	Very poor.	Fair	Very poor.	Very poor.	Fair	---	Very poor.
141C, 141D:											
Egeland	Very poor.	Fair	Good	Fair	Very poor.	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.
168B:											
Forman	Good	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.
180:											
Gonvick	Good	Good	Good	Good	Fair	---	Poor	Poor	Good	Good	Poor.
184:											
Hamerly	Good	Good	Good	Good	Good	Fair	Fair	Poor	Good	Good	Poor.
187:											
Haug	Fair	Fair	Poor	Poor	Poor	---	Good	Good	Fair	Poor	Good.
191:											
Epoufette	Fair	Fair	Poor	Poor	Poor	---	Good	Good	Fair	Poor	Good.
202:											
Meehan	Poor	Fair	Good	Fair	Fair	---	Fair	Fair	Fair	Fair	Fair.
258A, 258B, 258C:											
Sandberg	Poor	Poor	Good	Poor	Poor	---	Very poor.	Very poor.	Good	Good	Very poor.
260:											
Duelm	Fair	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor.
267B:											
Snellman	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
267C:											
Snellman	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
267E:											
Snellman	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
267F:											
Snellman	Very poor.	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
290:											
Rothsay	Good	Good	Fair	Fair	Fair	---	Poor	Very poor.	Good	Fair	Poor.
293B:											
Swenoda	Fair	Fair	Good	Good	Very poor.	---	Very poor.	Very poor.	Fair	Very poor.	Very poor.
335:											
Urness	Fair	Fair	Fair	Poor	Very poor.	Poor	Good	Good	Fair	Poor	Poor.
339:											
Fordville	Good	Good	Good	Poor	Very poor.	Fair	Very poor.	Very poor.	Good	Very poor.	Very poor.
341A, 341B:											
Arvilla	Fair	Good	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.
371:											
Clontarf	Fair	Fair	Good	Good	Good	Fair	Poor	Poor	Fair	Good	Poor.
375:											
Forada	Good	Good	Fair	Fair	Fair	---	Good	Good	Good	Fair	Good.
402C, 402E:											
Sioux	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
406A, 406B:											
Dorset	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
418:											
Lamoure	Good	Good	Fair	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
422B, 422C:											
Bygland	Good	Good	Good	Fair	---	Fair	Poor	Poor	Good	Poor	Poor.
426:											
Foldahl	Fair	Good	Good	Fair	Poor	---	Poor	Poor	Fair	Fair	Poor.
441A, 441B:											
Almora	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
441C:											
Almora	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
481:											
Kratka	Fair	Good	Good	Fair	Poor	---	Good	Fair	Fair	Fair	Fair.
494:											
Darnen	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
497:											
Hantho	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
508:											
Wyndmere	Fair	Good	Good	Good	Good	Fair	Fair	Poor	Good	Good	Poor.
540:											
Seelyeville	Very poor.	Poor	Good	Poor	Poor	---	Good	Good	Fair	Poor	Good.
541:											
Rifle	Fair	Poor	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good.
544:											
Cathro	Poor	Fair	Fair	Poor	Poor	---	Good	Good	Poor	Poor	Good.
567A, 567B:											
Verndale	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
609B:											
Dickey	Fair	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.
624:											
Rosy	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
646C:											
Peever	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
646D:											
Peever	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
670:											
Knute	Good	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor.
680:											
Parnell	Good	Good	Fair	Good	Fair	---	Good	Good	Good	Fair	Good.
698:											
Doran	Good	Good	Good	---	---	Poor	Fair	Fair	Good	---	Fair.
701:											
Runeberg	Very poor.	Poor	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
705B:											
Nitche	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Kandota	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Lida	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
705C:											
Nitche	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Kandota	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Lida	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
707B:											
Lizzie	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
707C2, 707D2:											
Lizzie	Poor	Good	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
710:											
Friberg	Poor	Fair	Fair	Fair	Fair	---	Good	Good	Fair	Fair	Good.
Weetown	Good	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor.
711B:											
Arvilla	Fair	Good	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.
Sandberg	Poor	Poor	Good	Poor	Poor	---	Very poor.	Very poor.	Good	Good	Very poor.
711C:											
Arvilla	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.
Sandberg	Poor	Poor	Good	Poor	Poor	---	Very poor.	Very poor.	Good	Good	Very poor.
715:											
Bluffcreek	Fair	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor.
Clearriver	Poor	Good	Good	Good	Good	---	Fair	Very poor.	Good	Good	Fair.
716B, 716C:											
Leaflake	Poor	Good	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Eagleview	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
716D:											
Leaflake	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Eagleview	Poor	Poor	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.
718E:											
Naytahwaush	Very poor.	Poor	Fair	Good	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.
721B, 721C:											
Corliss	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
721D:											
Corliss	Poor	Poor	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.
721E:											
Corliss	Very poor.	Very poor.	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.
726:											
Kratka	Poor	Poor	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good.
746:											
Haslie	Poor	Poor	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good.
760C2:											
Chapett	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Sisseton	Very poor.	Very poor.	Fair	Poor	Very poor.	---	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
760D2:											
Chapett	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Sisseton	Very poor.	Very poor.	Fair	Poor	Very poor.	---	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
769B:											
Mehurin	Good	Good	Good	Fair	Poor	Fair	Poor	Poor	Good	Fair	Poor.
776B:											
Snellman	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Poor.
Sugarbush	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
776C:											
Snellman	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Sugarbush	Fair	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
776E:											
Snellman	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Sugarbush	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
777C2, 777D2:											
Sisseton	Very poor.	Very poor.	Fair	Poor	Very poor.	---	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Heimdal	Fair	Good	Good	Fair	---	Fair	Very poor.	Very poor.	Good	---	Very poor.
777E:											
Sisseton	Very poor.	Very poor.	Fair	Poor	Very poor.	---	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Heimdal	Poor	Fair	Good	Fair	---	Fair	Very poor.	Very poor.	Good	---	Very poor.
778B, 778C:											
Dorset	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
Corliss	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
779B:											
Peever	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Mehurin	Good	Good	Good	Fair	Poor	Fair	Poor	Poor	Good	Fair	Poor.
902B:											
Barnes	Good	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.
Buse	Good	Good	Fair	Fair	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
903C2:											
Barnes	Fair	Good	Good	Good	Good	Fair	Very poor.	Very poor.	Good	Good	Very poor.
Langhei	Fair	Good	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
915C2:											
Forman	Fair	Good	Good	Good	Good	Fair	Very poor.	Very poor.	Good	Good	Very poor.
Buse	Fair	Good	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
915D2:											
Forman	Poor	Good	Good	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
Buse	Fair	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
931C2:											
Formdale	Good	Good	Good	Good	Fair	---	Poor	Fair	Good	Fair	Poor.
Langhei	Fair	Good	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
931D2:											
Formdale	Fair	Good	Good	Good	Fair	---	Poor	Poor	Good	Fair	Poor.
Langhei	Fair	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
942D2:											
Langhei	Fair	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Barnes	Poor	Fair	Good	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
957B2:											
Rothsay	Good	Good	Fair	Fair	Fair	---	Poor	Very poor.	Good	Fair	Poor.
Zell	Fair	Fair	Fair	Poor	Very poor.	---	Very poor.	Very poor.	Fair	Very poor.	Very poor.
969C2:											
Zell	Very poor.	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Rothsay	Good	Good	Fair	Fair	Fair	---	Poor	Very poor.	Good	Fair	Poor.
969D2:											
Zell	Very poor.	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Rothsay	Fair	Good	Fair	Fair	Fair	---	Poor	Very poor.	Good	Fair	Poor.
1016:											
Udorthents	Poor	Poor	Fair	Good	Good	Fair	Poor	Very poor.	Poor	Fair	Very poor.
1027:											
Udorthents.											
1030:											
Pits-Udipsamments.											
1077:											
Forada	Poor	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Leafriver	Very poor.	Poor	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good.
1102B:											
Chapett	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Dorset	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
1102C:											
Chapett	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Dorset	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
1103:											
Clitherall	Fair	Good	Good	Fair	Fair	---	Poor	Poor	Good	Fair	Poor.
1104B, 1104C:											
Waukon	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Dorset	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
1104D:											
Waukon	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Dorset	Poor	Poor	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.
1105B:											
Dent	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
1110:											
Isan	Poor	Fair	Good	Poor	Poor	---	Good	Good	Fair	Poor	Good.
1111:											
Nidaros	Very poor.	Very poor.	Poor	Poor	Poor	---	Good	Good	Very poor.	Poor	Good.
1112D:											
Chapett	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Corliss	Poor	Poor	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.
1112E:											
Chapett	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Corliss	Very poor.	Very poor.	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.
1113:											
Haslie	Very poor.	Very poor.	Poor	Very poor.	Very poor.	---	Good	Good	Poor	Very poor.	Good.
Seelyeville	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Good	Good	Very poor.	Very poor.	Good.
Cathro	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Good	Good	Very poor.	Very poor.	Good.
1114:											
Hangaard	Poor	Fair	Fair	Fair	Poor	---	Good	Good	Fair	Fair	Good.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
1120:											
Rushlake	Poor	Good	Good	Good	Good	---	Fair	Poor	Good	Good	Fair.
Hangaard	Poor	Fair	Fair	Fair	Poor	---	Good	Good	Fair	Fair	Good.
1129:											
Lindaas	Good	Good	Good	Good	Good	Good	Good	Good	Fair	Fair	Good.
1131B:											
Verndale	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Abbeylake	Poor	Fair	Fair	Poor	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
1136:											
Nidaros	Very poor.	Very poor.	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good.
1149:											
Hamerly	Good	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
1195A, 1195B:											
Sybil	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Eagleview	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
1195C:											
Sybil	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Eagleview	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
1195E:											
Sybil	Very poor.	Poor	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Eagleview	Poor	Poor	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.
1196B:											
Lida	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Two Inlets	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
1196C:											
Lida	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Two Inlets	Very poor.	Poor	Fair	Poor	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.
1196E:											
Lida	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
1196E:											
Two Inlets	Very poor.	Poor	Fair	Poor	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.
1196F:											
Lida	Very poor.	Poor	Good	Good	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.
Two Inlets	Very poor.	Poor	Fair	Poor	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.
1200:											
Egglake	Good	Good	Good	Good	Good	Good	Good	Good	Fair	Fair	Good.
1208B:											
Naytahwaush	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Mahkonce	Good	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor.
1209C:											
Naytahwaush	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
1212B:											
Mahkonce	Good	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor.
1214:											
Mustinka	Poor	Fair	Fair	---	---	Poor	Good	Good	Fair	---	Good.
1215:											
Pinelake	Poor	Fair	Good	Fair	Fair	---	Good	Good	Fair	Fair	Good.
1216B:											
Egglake	Good	Good	Good	Good	Good	Good	Good	Good	Fair	Fair	Good.
Wykeham	Good	Good	Good	Good	Fair	Good	Poor	Poor	Good	Good	Poor.
1217E:											
Waukon	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Lida	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
1218B:											
Snellman	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Poor.
Lida	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
1218C:											
Snellman	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Lida	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
1218E:											
Snellman	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Lida	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
1218F:											
Snellman	Very poor.	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Lida	Very poor.	Poor	Good	Good	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.
1219C:											
Sandberg	Poor	Poor	Good	Poor	Poor	---	Very poor.	Very poor.	Good	Good	Very poor.
Sverdrup	Fair	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
1221B:											
Sverdrup	Fair	Fair	Fair	Fair	Fair	---	Poor	Very poor.	Fair	Fair	Poor.
Sandberg	Poor	Poor	Good	Poor	Poor	---	Very poor.	Very poor.	Good	Good	Very poor.
1223D:											
Sandberg	Very poor.	Fair	Good	Poor	Poor	---	Very poor.	Very poor.	Fair	Poor	Very poor.
Arvilla	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.
1227:											
Quam	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
Cathro	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Good	Good	Very poor.	Very poor.	Good.
Urness	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Good	Good	Very poor.	Very poor.	Good.
1230:											
Haslie	Very poor.	Very poor.	Poor	Very poor.	Very poor.	---	Good	Good	Poor	Very poor.	Good.
Nidaros	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---	Good	Good	Very poor.	Very poor.	Good.
1232B:											
Chapett	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
1232E:											
Chapett	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
1234B:											
Formdale	Good	Good	Good	Good	Fair	---	Poor	Fair	Good	Fair	Poor.
Buse	Good	Good	Fair	Fair	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
1237:											
Lakepark	Good	Good	Good	Fair	Fair	Fair	Good	Good	Good	Fair	Good.
1239:											
Quam	Fair	Fair	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
1240:											
Roliss	Good	Good	Good	Fair	---	---	Good	Fair	Good	Fair	Fair.
1247D:											
Corliss	Poor	Poor	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.
Dorset	Poor	Poor	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.
1250C:											
Abbeylake	Poor	Fair	Fair	Poor	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.
Verndale	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
1259:											
Hamerly	Good	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
Mustinka	Poor	Fair	Fair	---	---	Poor	Good	Good	Fair	---	Good.
1275B:											
Kandota	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Egglake	Very poor.	Poor	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good.
1275C:											
Kandota	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Egglake	Very poor.	Poor	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good.
1276:											
Knute	Good	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor.
Brandsvold	Fair	Fair	Good	Fair	Fair	---	Good	Good	Fair	Fair	Good.
1277D:											
Corliss	Poor	Poor	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.
Sverdrup	Poor	Fair	Fair	Fair	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
1289:											
Knute	Good	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor.
1290:											
Brandsvold	Fair	Fair	Good	Fair	Fair	---	Good	Good	Fair	Fair	Good.
1291:											
Sedgeville	Very poor.	Poor	Poor	Fair	Fair	---	Good	Good	Poor	Fair	Good.
1293:											
Sedgeville	Poor	Fair	Fair	Fair	Fair	---	Good	Good	Poor	Fair	Good.
1304A:											
Glyndon	Good	Good	Good	Fair	Poor	Fair	Poor	Poor	Good	Fair	Poor.
1307:											
Rushlake	Poor	Good	Good	Good	Good	---	Fair	Poor	Good	Good	Fair.
1317:											
Vallers	Fair	Fair	Fair	Fair	Poor	Fair	Good	Good	Fair	Fair	Good.
1319B:											
Rockwood	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.
1319C:											
Rockwood	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
1319D:											
Rockwood	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
1320B:											
Blowers	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.
1321:											
Paddock	Fair	Good	Good	Good	Good	---	Fair	Fair	Fair	Good	Fair.
Becida	Fair	Fair	Good	Good	Good	---	Good	Good	Fair	Good	Good.
1322:											
Wolverton	Good	Good	Good	Fair	Poor	Poor	Poor	Poor	Good	Fair	Poor.
1324B:											
Heimdal	Good	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	---	Very poor.
Sisseton	Fair	Fair	Fair	Poor	Very poor.	---	Very poor.	Very poor.	Fair	Very poor.	Very poor.
1338:											
Oakcreek	Fair	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Poor.
1339:											
Borup	Poor	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
1340:											
Bluffcreek	Fair	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor.
Epoufette	Fair	Fair	Poor	Poor	Poor	---	Good	Good	Fair	Poor	Good.
1341:											
Clitherall	Fair	Good	Good	Fair	Fair	---	Poor	Poor	Good	Fair	Poor.
Wykeham	Good	Good	Good	Good	Fair	Good	Poor	Poor	Good	Good	Poor.
1342:											
Pinelake	Poor	Fair	Good	Fair	Fair	---	Good	Good	Fair	Fair	Good.
Brandsvold	Fair	Fair	Good	Fair	Fair	---	Good	Good	Fair	Fair	Good.
1343C:											
Lida	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Almora	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Lizzie	Poor	Good	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
1344B:											
Lida	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Almora	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
Dent	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
1345:											
Bluffcreek	Fair	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor.
Rosy	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
1346:											
Nidaros	Very poor.	Very poor.	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good.
1347B:											
Kandota	Good	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.
1348:											
Knute	Good	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor.
1349:											
Clotho	Fair	Fair	Good	Fair	Fair	---	Good	Good	Fair	Fair	Good.
1350:											
Brandsvold	Fair	Fair	Good	Fair	Fair	---	Good	Good	Fair	Fair	Good.
1351:											
Bluffton	Very poor.	Poor	Poor	Poor	Poor	---	Good	Good	Poor	Poor	Good.

Engineering

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

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

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

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

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

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

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

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

Building Site Development

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

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and

observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

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

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

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

Sanitary Facilities

The table “Sanitary Facilities” shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. It also shows the suitability of the soils for use as daily cover for landfill.

Soil properties are important in selecting sites for sanitary facilities and in identifying limiting soil properties and site features to be considered in planning, design, and installation. Soil limitation ratings of *slight, moderate,* or *severe* are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings of *good, fair,* and *poor* are given for daily cover for landfill.

A rating of *slight* or *good* indicates that the soils have no limitations or that the limitations can be easily overcome. Good performance and low maintenance can be expected. A rating of *moderate* or *fair* indicates that the limitations should be recognized but generally can be overcome by good management or special design. A rating of *severe* or *poor* indicates that overcoming the limitations is difficult or impractical. Increased maintenance may be required.

Septic tank absorption fields are areas in which subsurface systems of tile or perforated pipe distribute effluent from a septic tank into the natural soil. The centerline of the tile is assumed to be at a depth of 24 inches. Only the part of the soil between depths of 24 and 60 inches is considered in making the ratings. The soil properties and site features considered are those that affect the absorption of the effluent, those that affect the construction and maintenance of the system, and those that may affect public health.

The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

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

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted, relatively impervious soil material. Aerobic lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Relatively impervious soil material for the lagoon floor and sides

is desirable to minimize seepage and contamination of local ground water.

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

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

Trench sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil that is excavated from the trench. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. Soil properties that influence the risk of pollution, the ease of excavation, trafficability, and revegetation are the major considerations in rating the soils.

Area sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil that is imported from a source away from the site. A final cover of soil at least 2 feet thick is placed over the completed landfill. Soil properties that influence trafficability, revegetation, and the risk of pollution are the main considerations in rating the soils for area sanitary landfills.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. The ratings in the table “Sanitary Facilities” are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The suitability of a soil for use as cover is based on properties that affect workability and the ease of digging, moving, and spreading the material over the refuse daily during both wet and dry periods.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Waste Management

Soil properties are important when organic waste is applied as fertilizer and wastewater is applied in irrigated areas. They also are important when the soil is used as a medium for the treatment and disposal of the organic waste and wastewater. Unfavorable soil properties can result in environmental damage.

The use of organic waste and wastewater as production resources results in energy and resource conservation and minimizes the problems associated with waste disposal. If disposal is the goal, applying a maximum amount of the organic waste or the wastewater to a minimal area holds costs to a minimum and environmental damage is the main hazard. If reuse is the goal, a minimum amount should be applied to a maximum area and environmental damage is unlikely.

Interpretations developed for waste management may include ratings for manure- and food-processing waste, municipal sewage sludge, use of wastewater for irrigation, and treatment of wastewater by slow rate, overland flow, and rapid infiltration processes.

Specific information regarding waste management is available at the local office of the Natural Resources

Conservation Service or the Cooperative Extension Service.

Construction Materials

The table “Construction Materials” gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel.

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

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

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

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

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

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

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

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

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

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

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

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large

amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils generally is 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

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

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

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In the table "Water Management," 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 more than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the depth of the root zone, the amount of salts, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff.

Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct

surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Building Site Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
7A:						
Hubbard	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
7B:						
Hubbard	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
7C:						
Hubbard	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
26:						
Aazdahl	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
34:						
Parnell	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
38B:						
Waukon	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Slight.
38C2:						
Waukon	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
38D2, 38E:						
Waukon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
46:						
Borup	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
53B:						
Kandota	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
53C:						
Kandota	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
53D:						
Kandota	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
58:						
Kittson	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: frost action.	Slight.
59:						
Grimstad	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Slight.
61:						
Arveson	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
63:						
Rockwell	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
65:						
Foxhome	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Severe: frost action.	Slight.
66:						
Flaming	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
68:						
Arveson	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
107:						
Winger	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
108:						
McIntosh	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
121:						
Wykeham	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
127A:						
Sverdrup	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
127B:						
Sverdrup	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
127C:						
Sverdrup	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
141B:						
Egeland	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
141C:						
Egeland	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
141D:						
Egeland	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
168B:						
Forman	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
180:						
Gonvick	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
184:						
Hamerly	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Slight.
187:						
Haug	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
191:						
Epoufette	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
202:						
Meehan	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Severe: too acid.
258A, 258B:						
Sandberg	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
258C:						
Sandberg	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
260:						
Duelm	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
267B:						
Snellman	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Moderate: large stones.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
267C:						
Snellman	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: large stones, slope.
267E, 267F:						
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
290:						
Rothsay	Slight	Slight	Slight	Slight	Severe: frost action.	Slight.
293B:						
Swenoda	Moderate: wetness.	Slight	Moderate: wetness, shrink-swell.	Slight	Moderate: frost action.	Slight.
335:						
Urness	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: low strength, ponding, frost action.	Severe: ponding.
339:						
Fordville	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Slight.
341A:						
Arvilla	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
341B:						
Arvilla	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
371:						
Clontarf	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
375:						
Forada	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
402C:						
Sioux	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: droughty.
402E:						
Sioux	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
406A:						
Dorset	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
406B:						
Dorset	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
418:						
Lamoure	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
422B:						
Bygland	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
422C:						
Bygland	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Moderate: wetness, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
426:						
Foldahl	Severe: cutbanks cave.	Slight	Moderate: wetness, shrink-swell.	Slight	Severe: frost action.	Moderate: droughty.
441A:						
Almora	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
441B:						
Almora	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
441C:						
Almora	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: slope.
481:						
Kratka	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
494:						
Darnen	Severe: excess humus.	Severe: low strength.	Moderate: wetness, shrink-swell.	Severe: low strength.	Moderate: frost action.	Slight.
497:						
Hantho	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Severe: frost action.	Slight.
508:						
Wyndmere	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Moderate: wetness, droughty.
540:						
Seelyeville	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
541:						
Rifle	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, excess humus.
544:						
Cathro	Severe: excess humus, ponding.	Severe: subsides, ponding.	Severe: subsides, ponding.	Severe: subsides, ponding.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
567A:						
Verndale	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
567B:						
Verndale	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
609B:						
Dickey	Severe: cutbanks cave.	Slight	Moderate: shrink-swell.	Slight	Slight	Moderate: droughty.
624:						
Rosy	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Slight.
646C:						
Peever	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
646D:						
Peever	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
670:						
Knute	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Slight.
680:						
Parnell	Severe: excess humus, wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
698:						
Doran	Moderate: wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
701:						
Runeberg	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
705B:						
Nitche	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
Kandota	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
Lida	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: large stones, droughty.
705C:						
Nitche	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Kandota	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Lida	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
707B:						
Lizzie	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
707C2:						
Lizzie	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
707D2:						
Lizzie	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
710:						
Friberg	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
Weetown	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Slight.
711B:						
Arvilla	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Sandberg	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: small stones, droughty.
711C:						
Arvilla	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
711C:						
Sandberg	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, droughty.
715:						
Bluffcreek	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
Clearriver	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Severe: droughty.
716B:						
Leaflake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
Eagleview	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
716C:						
Leaflake	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Eagleview	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
716D:						
Leaflake	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Eagleview	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
718E:						
Naytahwaush	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
721B:						
Corliss	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: droughty.
721C:						
Corliss	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
721D, 721E:						
Corliss	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
726:						
Kratka	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
746:						
Haslie	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
760C2:						
Chapett	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Sisseton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
760D2:						
Chapett	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sisseton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
769B:						
Mehurin	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
776B:						
Snellman	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Moderate: large stones.
Sugarbush	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: large stones, droughty.
776C:						
Snellman	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: large stones, slope.
Sugarbush	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
776E:						
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sugarbush	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
777C2:						
Sisseton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Heimdal	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
777D2, 777E:						
Sisseton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Heimdal	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
778B:						
Dorset	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
Corliss	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
778C:						
Dorset	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Corliss	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
779B:						
Peever	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Mehurin	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
902B:						
Barnes	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Slight.
Buse	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Slight.
903C2:						
Barnes	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
Langhei	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
915C2:						
Forman	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: slope.
Buse	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
915D2:						
Forman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Buse	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
931C2:						
Formdale	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Langhei	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
931D2:						
Formdale	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
942D2:						
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Barnes	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
957B2:						
Rothsay	Slight	Slight	Slight	Moderate: slope.	Severe: frost action.	Slight.
Zell	Slight	Slight	Slight	Moderate: slope.	Severe: frost action.	Slight.
969C2:						
Zell	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
Rothsay	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
969D2:						
Zell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
Rothsay	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
1015:						
Udipsamments	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty, too sandy.
1016:						
Udorthents	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1027:						
Udorthents.						
1030:						
Pits.						
Udipsamments	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1077:						
Forada	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
Leafriver	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
1102B:						
Chapett	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
Dorset	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
1102C:						
Chapett	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Dorset	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
1103:						
Clitherall	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
1104B:						
Waukon	Slight	Slight	Slight	Slight	Moderate: low strength, frost action.	Slight.
Dorset	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
1104C:						
Waukon	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
Dorset	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
1104D:						
Waukon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1104D:						
Dorset	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1105B:						
Dent	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
1110:						
Isan	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1111:						
Nidaros	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, flooding, ponding.	Severe: subsides, flooding, ponding.	Severe: subsides, flooding, ponding.	Severe: subsides, ponding, flooding.	Severe: ponding, flooding, excess humus.
1112D, 1112E:						
Chapett	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Corliss	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
1113:						
Haslie	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Seelyeville	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
Cathro	Severe: excess humus, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
1114:						
Hangaard	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
1120:						
Rushlake	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Severe: droughty.
Hangaard	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
1129:						
Lindaas	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1131B:						
Verndale	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
Abbeylake	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
1136:						
Nidaros	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
1149:						
Hamerly	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Moderate: wetness.
1195A:						
Sybil	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
Eagleview	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
1195B:						
Sybil	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Eagleview	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
1195C:						
Sybil	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Eagleview	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
1195E:						
Sybil	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Eagleview	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1196B:						
Lida	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: large stones, droughty.
Two Inlets	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: small stones, droughty.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1196C:						
Lida	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
Two Inlets	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, droughty, slope.
1196E, 1196F:						
Lida	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Two Inlets	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1200:						
Egglake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1208B:						
Naytahwaush	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Mahkonce	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
1209C:						
Naytahwaush	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
1212B:						
Mahkonce	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
1214:						
Mustinka	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
1215:						
Pinelake	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1216B:						
Egglake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1216B:						
Wykeham	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
1217E:						
Waukon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lida	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1218B:						
Snellman	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Moderate: large stones.
Lida	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: large stones, droughty.
1218C:						
Snellman	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: large stones, slope.
Lida	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
1218E, 1218F:						
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lida	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1219C:						
Sandberg	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, droughty.
Sverdrup	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
1221B:						
Sverdrup	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Sandberg	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: small stones, droughty.
1223D:						
Sandberg	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1223D:						
Arvilla	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1227:						
Quam	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Cathro	Severe: excess humus, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
Urness	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: low strength, ponding, frost action.	Severe: ponding.
1230:						
Haslie	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Nidaros	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
1232B:						
Chapett	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
1232E:						
Chapett	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1234B:						
Formdale	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Buse	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
1237:						
Lakepark	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1239:						
Quam	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1240:						
Roliss	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
1247D:						
Corliss	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
Dorset	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1250C:						
Abbeylake	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
Verndale	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
1259:						
Hamerly	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Moderate: wetness.
Mustinka	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
1275B:						
Kandota	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Egglake	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
1275C:						
Kandota	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Egglake	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
1276:						
Knute	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Slight.
Brandsvold	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1277D:						
Corliss	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1277D:						
Sverdrup	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1289:						
Knute	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Slight.
1290:						
Brandsvold	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1291:						
Sedgeville	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding, frost action.	Severe: ponding, flooding.
1293:						
Sedgeville	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, frost action.	Severe: wetness.
1304A:						
Glyndon	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Moderate: wetness.
1307:						
Rushlake	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Severe: droughty.
1317:						
Vallers	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1319B:						
Rockwood	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Moderate: large stones.
1319C:						
Rockwood	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
1319D:						
Rockwood	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1320B:						
Blowers	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Severe: frost action.	Moderate: large stones.
1321:						
Paddock	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: large stones, wetness.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1321:						
Becida	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1322:						
Wolverton	Severe: cutbanks cave.	Slight	Moderate: wetness, shrink-swell.	Slight	Moderate: frost action.	Slight.
1324B:						
Heimdal	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Sisseton	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
1338:						
Oakcreek	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Slight.
1339:						
Borup	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
1340:						
Bluffcreek	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
Epoufette	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1341:						
Clitherall	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
Wykeham	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
1342:						
Pinelake	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
Brandsvold	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1343C:						
Lida	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, droughty, slope.
Almora	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: slope.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1343C:						
Lizzie	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
1344B:						
Lida	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: large stones, droughty.
Almora	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
Dent	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
1345:						
Bluffcreek	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
Rosy	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Slight.
1346:						
Nidaros	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
1347B:						
Kandota	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
1348:						
Knute	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Slight.
1349:						
Clotho	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1350:						
Brandsvold	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
1351:						
Bluffton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
1365:						
Hillview	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1396:						
Sedgeville	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding, frost action.	Severe: ponding, flooding.
Nidaros	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Aquolls	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
1397:						
Bemidji	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.
1825B:						
Seelyeville	Severe: excess humus, wetness.	Severe: subsides, wetness, low strength.	Severe: subsides, wetness, low strength.	Severe: subsides, wetness.	Severe: subsides, wetness, frost action.	Severe: wetness, excess humus.
1874:						
Radium	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Severe: droughty.
1943:						
Roscommon	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1975:						
Oylen	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Moderate: droughty.

Sanitary Facilities

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
7A, 7B:					
Hubbard	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
7C:					
Hubbard	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
26:					
Aazdahl	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
34:					
Parnell	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
38B:					
Waukon	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
38C2:					
Waukon	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
38D2, 38E:					
Waukon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
46:					
Borup	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: wetness.
53B:					
Kandota	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
53C:					
Kandota	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
53D:					
Kandota	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
58:					
Kittson	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
59:					
Grimstad	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
61:					
Arveson	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
63:					
Rockwell	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
65:					
Foxhome	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: too clayey, wetness.
66:					
Flaming	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
68:					
Arveson	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
107:					
Winger	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
108:					
McIntosh	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
121:					
Wykeham	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
127A, 127B:					
Sverdrup	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
127C:					
Sverdrup	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
141B:					
Egeland	Slight	Severe: seepage.	Slight	Severe: seepage.	Poor: thin layer.
141C:					
Egeland	Moderate: slope.	Severe: seepage, slope.	Moderate: slope.	Severe: seepage.	Poor: thin layer.
141D:					
Egeland	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: seepage, slope.	Poor: slope, thin layer.
168B:					
Forman	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
180:					
Gonvick	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
184:					
Hamerly	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
187:					
Haug	Severe: ponding.	Severe: seepage, excess humus, ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
191:					
Epoufette	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
202:					
Meehan	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
258A, 258B:					
Sandberg	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
258C:					
Sandberg	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
260:					
Duelm	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
267B:					
Snellman	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
267C:					
Snellman	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
267E, 267F:					
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
290:					
Rothsay	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
293B:					
Swenoda	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Moderate: wetness, too clayey.	Severe: seepage.	Fair: too clayey, wetness.
335:					
Urness	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
339:					
Fordville	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
341A, 341B:					
Arvilla	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
371:					
Clontarf	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
375:					
Forada	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
402C:					
Sioux	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
402E:					
Sioux	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
406A, 406B:					
Dorset	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
418:					
Lamoure	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
422B:					
Bygland	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
422C:					
Bygland	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
426:					
Foldahl	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: too clayey, small stones, wetness.
441A, 441B:					
Almora	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
441C:					
Almora	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
481:					
Kratka	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
494:					
Darnen	Severe: wetness.	Moderate: seepage, excess humus.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
497:					
Hantho	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
508:					
Wyndmere	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
540:					
Seelyeville	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
541:					
Rifle	Severe: ponding.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
544:					
Cathro	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
567A, 567B:					
Verndale	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
609B:					
Dickey	Severe: percs slowly, poor filter.	Severe: seepage.	Moderate: too clayey.	Severe: seepage.	Fair: too clayey.
624:					
Rosy	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy.
646C:					
Peever	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
646D:					
Peever	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
670:					
Knute	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
680:					
Parnell	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
698:					
Doran	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
701:					
Runeberg	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
705B:					
Nitche	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Kandota	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
Lida	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
705C:					
Nitche	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Kandota	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
Lida	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
707B:					
Lizzie	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey.
707C2:					
Lizzie	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: too clayey, slope.
707D2:					
Lizzie	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
710:					
Friberg	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Weetown	Severe: wetness.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Good.
711B:					
Arvilla	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Sandberg	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
711C:					
Arvilla	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Sandberg	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
715:					
Bluffcreek	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Clearriver	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
716B:					
Leaflake	Severe: poor filter.	Severe: seepage.	Slight	Severe: seepage.	Fair: small stones.
Eagleview	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
716C:					
Leaflake	Severe: poor filter.	Severe: seepage, slope.	Moderate: slope.	Severe: seepage.	Fair: small stones, slope.
Eagleview	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
716D:					
Leaflake	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: slope.	Severe: seepage, slope.	Poor: slope.
Eagleview	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
718E:					
Naytahwaush	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
721B:					
Corliss	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
721C:					
Corliss	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
721D, 721E:					
Corliss	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
726:					
Kratka	Severe: ponding, percs slowly, poor filter.	Severe: seepage, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
746:					
Haslie	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding, excess humus.	Severe: seepage, ponding.	Poor: hard to pack, ponding.
760C2:					
Chapett	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Sisseton	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
760D2:					
Chapett	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Sisseton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
769B:					
Mehurin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
776B:					
Snellman	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
Sugarbush	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
776C:					
Snellman	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
776C:					
Sugarbush	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
776E:					
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Sugarbush	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
777C2:					
Sisseton	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Heimdal	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
777D2, 777E:					
Sisseton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Heimdal	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
778B:					
Dorset	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Corliss	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
778C:					
Dorset	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Corliss	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
779B:					
Peever	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Mehurin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
902B:					
Barnes	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Buse	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
903C2:					
Barnes	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Langhei	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
915C2:					
Forman	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Buse	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
915D2:					
Forman	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Buse	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
931C2:					
Formdale	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Langhei	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
931D2:					
Formdale	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Langhei	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
942D2:					
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Barnes	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
957B2:					
Rothsay	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Zell	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
969C2:					
Zell	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Rothsay	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope.
969D2:					
Zell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Rothsay	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
1015:					
Udipsamments	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1016:					
Udorthents	Slight	Slight	Severe: slope.	Severe: slope.	Poor: slope, thin layer.
1027:					
Udorthents.					
1030:					
Pits.					
Udipsamments	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
1077:					
Forada	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Leafriver	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
1102B:					
Chapett	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1102B:					
Dorset	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
1102C:					
Chapett	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Dorset	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
1103:					
Clitherall	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
1104B:					
Waukon	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Dorset	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
1104C:					
Waukon	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Dorset	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
1104D:					
Waukon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Dorset	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
1105B:					
Dent	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
1110:					
Isan	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1111:					
Nidaros	Severe: subsides, flooding, ponding.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: ponding, excess humus.
1112D:					
Chapett	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Corliss	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
1112E:					
Chapett	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Corliss	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
1113:					
Haslie	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding, too clayey, excess humus.	Severe: seepage, ponding.	Poor: too clayey, hard to pack, ponding.
Seelyeville	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Cathro	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
1114:					
Hangaard	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
1120:					
Rushlake	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
Hangaard	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
1129:					
Lindaas	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1131B:					
Verndale	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Abbeylake	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1136:					
Nidaros	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
1149:					
Hamerly	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
1195A, 1195B:					
Sybil	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Eagleview	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1195C:					
Sybil	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Eagleview	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1195E:					
Sybil	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Eagleview	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
1196B:					
Lida	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Two Inlets	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1196C:					
Lida	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Two Inlets	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
1196E, 1196F:					
Lida	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Two Inlets	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
1200:					
Egglake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1208B:					
Naytahwaush	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Mahkonce	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
1209C:					
Naytahwaush	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
1212B:					
Mahkonce	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
1214:					
Mustinka	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
1215:					
Pinelake	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
1216B:					
Egglake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Wykeham	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1217E:					
Waukon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Lida	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
1218B:					
Snellman	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
Lida	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
1218C:					
Snellman	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
Lida	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
1218E, 1218F:					
Snellman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Lida	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
1219C:					
Sandberg	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Sverdrup	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1221B:					
Sverdrup	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Sandberg	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1223D:					
Sandberg	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Arvilla	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
1227:					
Quam	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Cathro	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
Urness	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
1230:					
Haslie	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding, too clayey, excess humus.	Severe: seepage, ponding.	Poor: too clayey, hard to pack, ponding.
Nidaros	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
1232B:					
Chapett	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
1232E:					
Chapett	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
1234B:					
Formdale	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Buse	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
1237:					
Lakepark	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1239:					
Quam	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1240:					
Roliss	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1247D:					
Corliss	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Dorset	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
1250C:					
Abbeylake	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Verndale	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
1259:					
Hamerly	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Mustinka	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
1275B:					
Kandota	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
Egglake	Severe: ponding.	Severe: seepage, ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
1275C:					
Kandota	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
Egglake	Severe: ponding.	Severe: seepage, ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
1276:					
Knute	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
Brandsvold	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1277D:					
Corliss	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Sverdrup	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
1289:					
Knute	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
1290:					
Brandsvold	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1291:					
Sedgeville	Severe: flooding, ponding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: seepage, too sandy, small stones.
1293:					
Sedgeville	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
1304A:					
Glyndon	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Fair: too sandy, wetness.
1307:					
Rushlake	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
1317:					
Vallers	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1319B:					
Rockwood	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
1319C:					
Rockwood	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
1319D:					
Rockwood	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1320B:					
Blowers	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Moderate: wetness, too sandy.	Moderate: wetness.	Fair: too sandy, small stones, wetness.
1321:					
Paddock	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Becida	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1322:					
Wolverton	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: too clayey, wetness.
1324B:					
Heimdal	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Sisseton	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
1338:					
Oakcreek	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: thin layer.
1339:					
Borup	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: ponding.
1340:					
Bluffcreek	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Epoufette	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
1341:					
Clitherall	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
Wykeham	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1342:					
Pinelake	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: seepage, small stones, wetness.
Brandsvold	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1343C:					
Lida	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Almora	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Lizzie	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: too clayey, slope.
1344B:					
Lida	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Almora	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Dent	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
1345:					
Bluffcreek	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Rosy	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy.
1346:					
Nidaros	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
1347B:					
Kandota	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
1348:					
Knute	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1349:					
Clotho	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1350:					
Brandsvold	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1351:					
Bluffton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
1365:					
Hillview	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy, wetness.
1396:					
Sedgeville	Severe: flooding, ponding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: seepage, too sandy, small stones.
Nidaros	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Aquolls	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: seepage, small stones, ponding.
1397:					
Bemidji	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
1825B:					
Seelyeville	Severe: subsides, wetness, percs slowly.	Severe: seepage, excess humus.	Severe: seepage, wetness, excess humus.	Severe: seepage, wetness.	Poor: wetness, excess humus.
1874:					
Radium	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
1943:					
Roscommon	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1975:					
Oylen	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.

Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
7A, 7B:				
Hubbard	Good	Probable	Improbable: too sandy.	Fair: too sandy.
7C:				
Hubbard	Good	Probable	Improbable: too sandy.	Fair: too sandy, slope.
26:				
Aazdahl	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
34:				
Parnell	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
38B:				
Waukon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
38C2:				
Waukon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
38D2:				
Waukon	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
38E:				
Waukon	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
46:				
Borup	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
53B, 53C:				
Kandota	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
53D:				
Kandota	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
58:				
Kittson	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
59:				
Grimstad	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
61:				
Arveson	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
63:				
Rockwell	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
65:				
Foxhome	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
66:				
Flaming	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
68:				
Arveson	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
107:				
Winger	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
108:				
McIntosh	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
121:				
Wykeham	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
127A, 127B, 127C:				
Sverdrup	Good	Probable	Improbable: too sandy.	Poor: too sandy.
141B:				
Egeland	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
141C:				
Egeland	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
141D:				
Egeland	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
168B:				
Forman	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
180:				
Gonvick	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
184:				
Hamerly	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
187:				
Haug	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
191:				
Epoufette	Poor: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
202:				
Meehan	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
258A, 258B, 258C:				
Sandberg	Good	Probable	Probable	Poor: small stones, area reclaim.
260:				
Duelm	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
267B, 267C:				
Snellman	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
267E:				
Snellman	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
267F:				
Snellman	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
290:				
Rothsay	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
293B:				
Swenoda	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
335:				
Urness	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
339:				
Fordville	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
341A, 341B:				
Arvilla	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
371:				
Clontarf	Fair: wetness.	Probable	Improbable: too sandy.	Fair: thin layer.
375:				
Forada	Poor: wetness.	Probable	Probable	Poor: small stones, wetness.
402C:				
Sioux	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
402E:				
Sioux	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
406A, 406B:				
Dorset	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
418:				
Lamoure	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
422B, 422C:				
Bygland	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
426:				
Foldahl	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
441A, 441B, 441C:				
Almora	Good	Probable	Improbable: too sandy.	Poor: small stones, area reclaim.
481:				
Kratka	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
494:				
Darnen	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
497:				
Hantho	Fair: low strength, thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
508:				
Wyndmere	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
540:				
Seelyeville	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
541:				
Rifle	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
544:				
Cathro	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
567A, 567B:				
Verndale	Good	Probable	Improbable: too sandy.	Poor: too sandy.
609B:				
Dickey	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
624:				
Rosy	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
646C:				
Peever	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
646D:				
Peever	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
670:				
Knute	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
680:				
Parnell	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
698:				
Doran	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
701:				
Runeberg	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
705B, 705C:				
Nitche	Good	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones.
Kandota	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Lida	Good	Probable	Probable	Poor: small stones, area reclaim.
707B:				
Lizzie	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
707C2:				
Lizzie	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
707D2:				
Lizzie	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
710:				
Friberg	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Weetown	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
711B, 711C:				
Arvilla	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Sandberg	Good	Probable	Probable	Poor: small stones, area reclaim.
715:				
Bluffcreek	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones.
Clearriver	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, small stones.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
716B, 716C:				
Leaflake	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
Eagleview	Good	Probable	Improbable: too sandy.	Poor: too sandy.
716D:				
Leaflake	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, slope.
Eagleview	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
718E:				
Naytahwaush	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
721B, 721C:				
Corliss	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
721D:				
Corliss	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
721E:				
Corliss	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
726:				
Kratka	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
746:				
Haslie	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
760C2:				
Chapett	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Sisseton	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
760D2:				
Chapett	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Sisseton	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
769B:				
Mehurin	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
776B, 776C:				
Snellman	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Sugarbush	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
776E:				
Snellman	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Sugarbush	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
777C2:				
Sisseton	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Heimdal	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
777D2:				
Sisseton	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Heimdal	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
777E:				
Sisseton	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Heimdal	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
778B, 778C:				
Dorset	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Corliss	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
779B:				
Peever	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Mehurin	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
902B:				
Barnes	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Buse	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
903C2:				
Barnes	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Langhei	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
915C2:				
Forman	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Buse	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
915D2:				
Forman	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Buse	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
931C2:				
Formdale	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
931C2:				
Langhei	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
931D2:				
Formdale	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Langhei	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
942D2:				
Langhei	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Barnes	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
957B2:				
Rothsay	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Zell	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
969C2:				
Zell	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Rothsay	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
969D2:				
Zell	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Rothsay	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
1015:				
Udipsamments	Good	Probable	Probable	Poor: too sandy.
1016:				
Udorthents	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
1027:				
Udorthents.				
1030:				
Pits.				
Udipsamments	Poor: slope.	Probable	Probable	Poor: too sandy, slope.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1077:				
Forada	Poor: wetness.	Probable	Probable	Poor: small stones, wetness.
Leafriver	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
1102B:				
Chapett	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Dorset	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1102C:				
Chapett	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Dorset	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1103:				
Clitherall	Fair: wetness.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones.
1104B:				
Waukon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Dorset	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1104C:				
Waukon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Dorset	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1104D:				
Waukon	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1104D:				
Dorset	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1105B:				
Dent	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
1110:				
Isan	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
1111:				
Nidaros	Poor: wetness.	Probable	Probable	Poor: excess humus, wetness.
1112D:				
Chapett	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Corliss	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1112E:				
Chapett	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Corliss	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1113:				
Haslie	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
Seelyeville	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Cathro	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
1114:				
Hangaard	Poor: wetness.	Probable	Probable	Poor: too sandy, small stones, wetness.
1120:				
Rushlake	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1120:				
Hangaard	Poor: wetness.	Probable	Probable	Poor: too sandy, small stones, wetness.
1129:				
Lindaas	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
1131B:				
Verndale	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Abbeylake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1136:				
Nidaros	Poor: wetness.	Probable	Probable	Poor: excess humus, wetness.
1149:				
Hamerly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
1195A, 1195B, 1195C:				
Sybil	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Eagleview	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1195E:				
Sybil	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Eagleview	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
1196B, 1196C:				
Lida	Good	Probable	Probable	Poor: small stones, area reclaim.
Two Inlets	Good	Probable	Probable	Poor: small stones, area reclaim.
1196E:				
Lida	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Two Inlets	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1196F:				
Lida	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Two Inlets	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
1200:				
Egglake	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1208B:				
Naytahwaush	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Mahkonce	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
1209C:				
Naytahwaush	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
1212B:				
Mahkonce	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
1214:				
Mustinka	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
1215:				
Pinelake	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
1216B:				
Egglake	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Wykeham	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
1217E:				
Waukon	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Lida	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1218B, 1218C:				
Snellman	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Lida	Good	Probable	Probable	Poor: small stones, area reclaim.
1218E:				
Snellman	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Lida	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
1218F:				
Snellman	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Lida	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
1219C:				
Sandberg	Good	Probable	Probable	Poor: small stones, area reclaim.
Sverdrup	Good	Probable	Improbable: too sandy.	Poor: too sandy.
1221B:				
Sverdrup	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Sandberg	Good	Probable	Probable	Poor: small stones, area reclaim.
1223D:				
Sandberg	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Arvilla	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1227:				
Quam	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Cathro	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1227:				
Urness	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1230:				
Haslie	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
Nidaros	Poor: wetness.	Probable	Probable	Poor: excess humus, wetness.
1232B:				
Chapett	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
1232E:				
Chapett	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
1234B:				
Formdale	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
1237:				
Lakepark	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1239:				
Quam	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1240:				
Roliss	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1247D:				
Corliss	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Dorset	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1250C:				
Abbeylake	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Verndale	Good	Probable	Improbable: too sandy.	Poor: too sandy.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1259:				
Hamerly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Mustinka	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
1275B, 1275C:				
Kandota	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Egglake	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1276:				
Knute	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Brandsvold	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1277D:				
Corliss	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Sverdrup	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
1289:				
Knute	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
1290:				
Brandsvold	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1291, 1293:				
Sedgeville	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
1304A:				
Glyndon	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
1307:				
Rushlake	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
1317:				
Vallers	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1319B:				
Rockwood	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
1319C:				
Rockwood	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
1319D:				
Rockwood	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
1320B:				
Blowers	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
1321:				
Paddock	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Becida	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
1322:				
Wolverton	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
1324B:				
Heimdal	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Sisseton	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
1338:				
Oakcreek	Fair: wetness.	Probable	Probable	Poor: area reclaim.
1339:				
Borup	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1340:				
Bluffcreek	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones.
Epoufette	Poor: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1341:				
Clitherall	Fair: wetness.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones.
Wykeham	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
1342:				
Pinelake	Poor: wetness.	Probable	Improbable: too sandy.	Poor: small stones, area reclaim, wetness.
Brandsvold	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1343C:				
Lida	Good	Probable	Probable	Poor: small stones, area reclaim.
Almora	Good	Probable	Improbable: too sandy.	Poor: small stones, area reclaim.
Lizzie	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
1344B:				
Lida	Good	Probable	Probable	Poor: small stones, area reclaim.
Almora	Good	Probable	Improbable: too sandy.	Poor: small stones, area reclaim.
Dent	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
1345:				
Bluffcreek	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones.
Rosy	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
1346:				
Nidaros	Poor: wetness.	Probable	Probable	Poor: excess humus, wetness.
1347B:				
Kandota	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
1348:				
Knute	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1349:				
Clotho	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1350:				
Brandsvold	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1351:				
Bluffton	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1365:				
Hillview	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1396:				
Sedgeville	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
Nidaros	Poor: wetness.	Probable	Probable	Poor: excess humus, wetness.
Aquolls	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
1397:				
Bemidji	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
1825B:				
Seelyeville	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
1874:				
Radium	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
1943:				
Roscommon	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
1975:				
Oylen	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.

Water Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
7A:							
Hubbard	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
7B:							
Hubbard	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
7C:							
Hubbard	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
26:							
Aazdahl	Slight	Moderate: wetness.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
34:							
Parnell	Slight	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
38B:							
Waukon	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
38C2:							
Waukon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
38D2:							
Waukon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
38E:							
Waukon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
46:							
Borup	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness	Wetness	Wetness.
53B:							
Kandota	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Soil blowing	Rooting depth.
53C:							
Kandota	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
53D:							
Kandota	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
58:							
Kittson	Moderate: seepage.	Moderate: piping, wetness.	Severe: slow refill.	Frost action	Wetness	Wetness	Favorable.
59:							
Grimstad	Severe: seepage.	Severe: piping.	Severe: cutbanks cave.	Favorable	Wetness	Erodes easily, wetness, soil blowing.	Erodes easily.
61:							
Arveson	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness	Wetness, too sandy.	Wetness.
63:							
Rockwell	Severe: seepage.	Severe: piping, wetness.	Severe: slow refill, cutbanks cave.	Frost action	Wetness	Wetness	Wetness.
65:							
Foxhome	Severe: seepage.	Severe: piping.	Severe: cutbanks cave.	Frost action	Wetness, soil blowing.	Wetness, soil blowing.	Favorable.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
66:							
Flaming	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty.
68:							
Arveson	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, frost action, cutbanks cave.	Ponding	Ponding, too sandy.	Wetness.
107:							
Winger	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness	Wetness	Wetness.
108:							
McIntosh	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
121:							
Wykeham	Moderate: seepage.	Moderate: wetness.	Severe: cutbanks cave.	Favorable	Wetness, soil blowing.	Wetness, soil blowing.	Rooting depth.
127A:							
Sverdrup	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
127B:							
Sverdrup	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
127C:							
Sverdrup	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
141B:							
Egeland	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Soil blowing	Droughty.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
141C:							
Egeland	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, soil blowing.	Slope, droughty.
141D:							
Egeland	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, soil blowing.	Slope, droughty.
168B:							
Forman	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
180:							
Gonvick	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Frost action	Wetness	Wetness	Favorable.
184:							
Hamerly	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
187:							
Haug	Moderate: seepage.	Severe: piping, ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
191:							
Epoufette	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
202:							
Meehan	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, too acid.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
258A:							
Sandberg	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
258B:							
Sandberg	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
258C:							
Sandberg	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
260:							
Duelm	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty.
267B:							
Snellman	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Soil blowing	Rooting depth.
267C:							
Snellman	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
267E:							
Snellman	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
267F:							
Snellman	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
290:							
Rothsay	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
293B:							
Swenoda	Severe: seepage.	Severe: piping.	Severe: no water.	Favorable	Wetness, soil blowing.	Erodes easily, wetness.	Erodes easily.
335:							
Urness	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
339:							
Fordville	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Rooting depth	Too sandy	Rooting depth.
341A:							
Arvilla	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
341B:							
Arvilla	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
371:							
Clontarf	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Droughty.
375:							
Forada	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness	Wetness, too sandy.	Wetness.
402C:							
Sioux	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
402E:							
Sioux	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
406A:							
Dorset	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
406B:							
Dorset	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
418:							
Lamoure	Moderate: seepage.	Severe: hard to pack, wetness.	Severe: slow refill.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
422B:							
Bygland	Moderate: slope.	Moderate: piping, hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily, percs slowly.
422C:							
Bygland	Severe: slope.	Moderate: piping, hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action, slope.	Slope, wetness.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
426:							
Foldahl	Severe: seepage.	Severe: piping.	Severe: slow refill, cutbanks cave.	Frost action	Wetness, droughty.	Erodes easily, wetness, soil blowing.	Erodes easily, droughty.
441A:							
Almora	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable	Favorable.
441B:							
Almora	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
441C:							
Almora	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
481:							
Kratka	Severe: seepage.	Severe: piping, wetness.	Severe: slow refill, cutbanks cave.	Favorable	Wetness, droughty.	Erodes easily, wetness, soil blowing.	Wetness, erodes easily, droughty.
494:							
Darnen	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Favorable	Erodes easily	Erodes easily.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
497:							
Hantho	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
508:							
Wyndmere	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
540:							
Seelyeville	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
541:							
Rifle	Severe: seepage.	Severe: excess humus, ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
544:							
Cathro	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
567A:							
Verndale	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
567B:							
Verndale	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
609B:							
Dickey	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Erodes easily, soil blowing.	Erodes easily, droughty.
624:							
Rosy	Moderate: seepage.	Severe: piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, soil blowing.	Wetness, too sandy, soil blowing.	Favorable.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
646C:							
Peever	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
646D:							
Peever	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
670:							
Knute	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Favorable	Wetness, soil blowing.	Wetness, soil blowing.	Favorable.
680:							
Parnell	Moderate: seepage.	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
698:							
Doran	Moderate: seepage.	Moderate: piping, wetness.	Severe: slow refill.	Deep to water	Percs slowly	Erodes easily, percs slowly.	Erodes easily, percs slowly.
701:							
Runeberg	Slight	Severe: piping, ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, rooting depth, percs slowly.
705B:							
Nitche	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
Kandota	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Soil blowing	Rooting depth.
Lida	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
705C:							
Nitche	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
Kandota	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
Lida	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
707B:							
Lizzie	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
707C2:							
Lizzie	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
707D2:							
Lizzie	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
710:							
Friberg	Moderate: seepage.	Severe: thin layer, wetness.	Moderate: slow refill.	Frost action	Wetness	Wetness	Wetness.
Weetown	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Soil blowing	Soil blowing	Favorable.
711B:							
Arvilla	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Sandberg	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
711C:							
Arvilla	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
Sandberg	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
715:							
Bluffcreek	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
Clearriver	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty.
716B:							
Leaflake	Severe: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Soil blowing	Droughty.
Eagleview	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
716C:							
Leaflake	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, soil blowing.	Slope, droughty.
Eagleview	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
716D:							
Leaflake	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, soil blowing.	Slope, droughty.
Eagleview	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
718E:							
Naytahwaush	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily.	Slope, erodes easily, percs slowly.
721B:							
Corliss	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
721C:							
Corliss	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
721D:							
Corliss	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
721E:							
Corliss	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
726:							
Kratka	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding	Ponding, droughty.	Ponding, soil blowing.	Wetness, droughty, rooting depth.
746:							
Haslie	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, percs slowly, subsides.	Ponding, soil blowing, percs slowly.	Ponding, soil blowing, percs slowly.	Wetness, percs slowly.
760C2:							
Chapett	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.
Sisseton	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
760D2:							
Chapett	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.
Sisseton	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
769B:							
Mehurin	Moderate: seepage.	Moderate: piping, wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
776B:							
Snellman	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Soil blowing	Rooting depth.
Sugarbush	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty, rooting depth.
776C:							
Snellman	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
Sugarbush	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
776E:							
Snellman	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
Sugarbush	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
777C2:							
Sisseton	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Heimdal	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
777D2:							
Sisseton	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Heimdal	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.
777E:							
Sisseton	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Heimdal	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.
778B:							
Dorset	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Corliss	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
778C:							
Dorset	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
Corliss	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
779B:							
Peever	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Mehurin	Moderate: seepage, slope.	Moderate: piping, wetness.	Severe: slow refill.	Percs slowly, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
902B:							
Barnes	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Buse	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
903C2:							
Barnes	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Langhei	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
915C2:							
Forman	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Buse	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
915D2:							
Forman	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Buse	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
931C2:							
Formdale	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Langhei	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
931D2:							
Formdale	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Langhei	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
942D2:							
Langhei	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Barnes	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
957B2:							
Rothsay	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Zell	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
969C2:							
Zell	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Rothsay	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
969D2:							
Zell	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Rothsay	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
1015:							
Udipsamments	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
1016:							
Udorthents	Slight	Slight	Severe: no water.	Deep to water	Slope	Slope	Slope.
1027:							
Udorthents.							

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1030:							
Pits.							
Udipsamments	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
1077:							
Forada	Severe: seepage.	Severe: seepage, ponding.	Severe: cutbanks cave.	Ponding, frost action, cutbanks cave.	Ponding	Ponding, too sandy.	Wetness.
Leafriver	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, too sandy, soil blowing.	Wetness.
1102B:							
Chapett	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Favorable	Rooting depth.
Dorset	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
1102C:							
Chapett	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.
Dorset	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
1103:							
Clitherall	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1104B:							
Waukon	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
Dorset	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
1104C:							
Waukon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Dorset	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
1104D:							
Waukon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Dorset	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
1105B:							
Dent	Moderate: seepage, slope.	Severe: piping.	Severe: cutbanks cave.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily.
1110:							
Isan	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
1111:							
Nidaros	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill, cutbanks cave.	Ponding, flooding, subsides.	Ponding, soil blowing, rooting depth.	Ponding, soil blowing.	Wetness, rooting depth.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1112D:							
Chapett	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.
Corliss	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
1112E:							
Chapett	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.
Corliss	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
1113:							
Haslie	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, percs slowly, subsides.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
Seelyeville	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
Cathro	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
1114:							
Hangaard	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
1120:							
Rushlake	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
Hangaard	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1129:							
Lindaas	Slight	Severe: piping, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness	Wetness, percs slowly.
1131B:							
Verndale	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Abbeylake	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
1136:							
Nidaros	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, soil blowing, rooting depth.	Ponding, too sandy, soil blowing.	Wetness, rooting depth.
1149:							
Hamerly	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
1195A:							
Sybil	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Eagleview	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
1195B:							
Sybil	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Eagleview	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1195C:							
Sybil	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Eagleview	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
1195E:							
Sybil	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
Eagleview	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
1196B:							
Lida	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
Two Inlets	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty, rooting depth.
1196C:							
Lida	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
Two Inlets	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
1196E:							
Lida	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
Two Inlets	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1196F:							
Lida	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
Two Inlets	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
1200:							
Egglake	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Frost action	Wetness, rooting depth.	Wetness	Wetness, rooting depth.
1208B:							
Naytahwaush	Moderate: slope.	Slight	Severe: no water.	Deep to water	Slope, percs slowly.	Erodes easily	Erodes easily, percs slowly.
Mahkonce	Slight	Moderate: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness	Wetness	Percs slowly.
1209C:							
Naytahwaush	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, erodes easily.	Slope, erodes easily, percs slowly.
1212B:							
Mahkonce	Slight	Moderate: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness	Wetness	Percs slowly.
1214:							
Mustinka	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
1215:							
Pinelake	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, soil blowing.	Wetness, too sandy, soil blowing.	Wetness.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1216B:							
Egglake	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Frost action	Wetness, soil blowing, rooting depth.	Wetness, soil blowing.	Wetness, rooting depth.
Wykeham	Moderate: seepage, slope.	Moderate: wetness.	Severe: cutbanks cave.	Slope	Slope, wetness, soil blowing.	Wetness, soil blowing.	Rooting depth.
1217E:							
Waukon	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Lida	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
1218B:							
Snellman	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Soil blowing	Rooting depth.
Lida	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
1218C:							
Snellman	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
Lida	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
1218E:							
Snellman	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
Lida	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1218F:							
Snellman	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
Lida	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
1219C:							
Sandberg	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
Sverdrup	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
1221B:							
Sverdrup	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Sandberg	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
1223D:							
Sandberg	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
Arvilla	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
1227:							
Quam	Slight	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Erodes easily, ponding.	Wetness, erodes easily.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1227:							
Cathro	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
Urness	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
1230:							
Haslie	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, percs slowly, subsides.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
Nidaros	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, rooting depth.	Ponding	Wetness, rooting depth.
1232B:							
Chapett	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Favorable	Rooting depth.
1232E:							
Chapett	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Slope	Slope, rooting depth.
1234B:							
Formdale	Moderate: slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
Buse	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
1237:							
Lakepark	Slight	Severe: wetness.	Severe: slow refill.	Frost action	Wetness	Wetness	Wetness.
1239:							
Quam	Slight	Severe: piping, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Erodes easily, ponding.	Wetness, erodes easily.
1240:							
Roliss	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness	Wetness	Wetness.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1247D:							
Corliss	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Dorset	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
1250C:							
Abbeylake	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Verndale	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
1259:							
Hamerly	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
Mustinka	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
1275B:							
Kandota	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Soil blowing	Rooting depth.
Egglake	Moderate: seepage.	Severe: thin layer, ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
1275C:							
Kandota	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, rooting depth.	Slope, soil blowing.	Slope, rooting depth.
Egglake	Moderate: seepage.	Severe: thin layer, ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1276:							
Knute	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Favorable	Wetness, soil blowing.	Wetness, soil blowing.	Favorable.
Brandsvold	Moderate: seepage.	Severe: thin layer, wetness.	Severe: slow refill.	Frost action	Wetness, soil blowing.	Wetness, soil blowing.	Wetness.
1277D:							
Corliss	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Sverdrup	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
1289:							
Knute	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Favorable	Wetness, soil blowing.	Wetness, soil blowing.	Favorable.
1290:							
Brandsvold	Moderate: seepage.	Severe: thin layer, wetness.	Severe: slow refill.	Frost action	Wetness, soil blowing.	Wetness, soil blowing.	Wetness.
1291:							
Sedgeville	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding, too sandy.	Wetness.
1293:							
Sedgeville	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
1304A:							
Glyndon	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, soil blowing.	Erodes easily, wetness, soil blowing.	Erodes easily.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1307:							
Rushlake	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
1317:							
Vallers	Slight	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
1319B:							
Rockwood	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, percs slowly.	Soil blowing	Rooting depth.
1319C:							
Rockwood	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, percs slowly.	Slope, soil blowing.	Slope, rooting depth.
1319D:							
Rockwood	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing, percs slowly.	Slope, soil blowing.	Slope, rooting depth.
1320B:							
Blowers	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Frost action, slope, cutbanks cave.	Slope, wetness, soil blowing.	Wetness, too sandy, soil blowing.	Rooting depth.
1321:							
Paddock	Moderate: seepage.	Severe: piping.	Severe: no water.	Frost action	Wetness, soil blowing, percs slowly.	Wetness, soil blowing.	Wetness, rooting depth.
Becida	Moderate: seepage.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, cutbanks cave.	Wetness	Wetness, too sandy.	Wetness, rooting depth.
1322:							
Wolverton	Severe: seepage.	Moderate: piping, wetness.	Severe: slow refill, cutbanks cave.	Favorable	Wetness	Wetness, soil blowing.	Favorable.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1324B:							
Heimdal	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Favorable	Rooting depth.
Sisseton	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
1338:							
Oakcreek	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Favorable	Wetness	Erodes easily, wetness.	Erodes easily.
1339:							
Borup	Severe: seepage.	Severe: piping, ponding.	Severe: cutbanks cave.	Ponding, frost action, cutbanks cave.	Ponding, excess salt.	Ponding	Wetness.
1340:							
Bluffcreek	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
Epoufette	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
1341:							
Clitherall	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
Wykeham	Moderate: seepage.	Moderate: wetness.	Severe: cutbanks cave.	Favorable	Wetness, soil blowing.	Wetness, soil blowing.	Rooting depth.
1342:							
Pinelake	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, soil blowing.	Wetness, too sandy, soil blowing.	Wetness.
Brandsvold	Moderate: seepage.	Severe: thin layer, wetness.	Severe: slow refill.	Frost action	Wetness, soil blowing.	Wetness, soil blowing.	Wetness.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1343C:							
Lida	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
Almora	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, soil blowing.	Slope.
Lizzie	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, erodes easily, soil blowing.	Slope, erodes easily.
1344B:							
Lida	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
Almora	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Soil blowing	Favorable.
Dent	Moderate: seepage, slope.	Severe: piping.	Severe: cutbanks cave.	Frost action, slope.	Slope, wetness, soil blowing.	Erodes easily, wetness, soil blowing.	Erodes easily.
1345:							
Bluffcreek	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
Rosy	Moderate: seepage.	Severe: piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, soil blowing.	Wetness, too sandy, soil blowing.	Favorable.
1346:							
Nidaros	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, soil blowing, rooting depth.	Ponding, too sandy, soil blowing.	Wetness, rooting depth.
1347B:							
Kandota	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth.	Favorable	Rooting depth.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1348:							
Knute	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Favorable	Wetness	Wetness	Favorable.
1349:							
Clotho	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness, rooting depth.	Wetness	Wetness, rooting depth.
1350:							
Brandsvold	Moderate: seepage.	Severe: thin layer, wetness.	Severe: slow refill.	Frost action	Wetness	Wetness	Wetness.
1351:							
Bluffton	Moderate: seepage.	Severe: piping, ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
1365:							
Hillview	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, soil blowing.	Wetness, too sandy, soil blowing.	Wetness.
1396:							
Sedgeville	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding, too sandy.	Wetness.
Nidaros	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, soil blowing, rooting depth.	Ponding, too sandy, soil blowing.	Wetness, rooting depth.
Aquolls	Moderate: seepage.	Severe: seepage, piping, ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
1397:							
Bemidji	Severe: seepage.	Severe: piping.	Severe: cutbanks cave.	Favorable	Wetness, droughty, fast intake.	Wetness, soil blowing.	Droughty, rooting depth.

Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1825B:							
Seelyeville	Severe: seepage.	Severe: excess humus, wetness.	Severe: slow refill.	Subsides, frost action, slope.	Slope, wetness.	Wetness	Wetness.
1874:							
Radium	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty, rooting depth.
1943:							
Roscommon	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty, rooting depth.
1975:							
Oylen	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Droughty.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

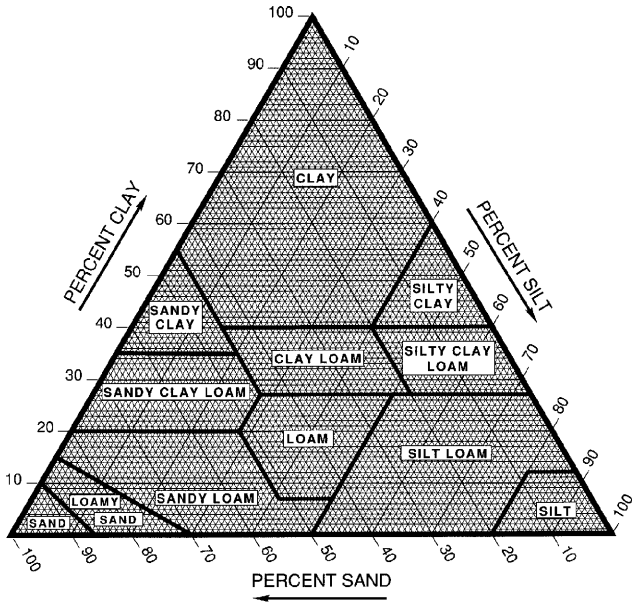


Figure 27.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

The table "Engineering Index Properties" gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

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. 27). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1993) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to

those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 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 grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

The tables “Physical Properties of the Soils” and “Chemical Properties of the Soils” show estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^1/_3$-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In the table “Physical Properties of the Soils,” the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to

be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, more than 9 percent, is sometimes used.

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

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (as much as 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion.

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 rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams that have more than 5 percent finely divided calcium carbonate. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if measures to control soil blowing are used.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if ordinary measures to control soil blowing are used.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils have less than 5 percent finely divided calcium carbonate. They are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.
8. Soils that are not subject to soil blowing because of rock fragments on the surface or because of surface wetness.

The *wind erodibility index* is a number that is determined based on the percentage of dry,

nonerodible surface soil aggregates larger than 0.84 millimeter in diameter. It is an expression of the stability of the soil aggregates, or the extent to which they are broken down by tillage and the abrasion caused by windblown soil particles.

In the table "Chemical Properties of the Soils," *cation-exchange capacity* is 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. It is a measurement of the nutrient-holding capacity of the soil.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate is expressed as a weighted percentage of the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients, such as phosphorus, is affected by the amount of carbonates in the soil.

Gypsum is expressed as the percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Soils high in gypsum, such as those that are more than 10 percent gypsum, may collapse if the gypsum is removed by percolating water. Gypsum is corrosive to concrete. Corrosion of concrete is most likely to occur in soils that are more than about 1 percent gypsum when wetting and drying occur.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Water Features

The table "Water Features" gives estimates of several important water features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Hydrologic soil groups are groups of soils that, when saturated, have the same runoff potential under similar storm and ground cover conditions. The soil properties that affect the runoff potential are those that influence the minimum rate of infiltration in a bare soil after prolonged wetting and when the soil is not frozen. These properties include the depth to a seasonal high water table, the infiltration rate, permeability after prolonged wetting, and the depth to a very slowly permeable layer. The influences of ground cover and slope are treated independently and are not taken into account in hydrologic soil groups.

In the definitions of the hydrologic soil groups, the infiltration rate is the rate at which water enters the soil at the surface and is controlled by surface conditions. The transmission rate is the rate at which water moves through the soil and is controlled by properties of the soil layers.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of very 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 a moderately fine 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 that have a moderately fine 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 clayey soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in the table, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams or by runoff from adjacent slopes. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in marshes and swamps or in closed depressions is considered to be ponding.

The table "Water Features" gives the frequency and duration of flooding and the time of year when flooding is most likely to occur. Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as none, rare, occasional, or frequent. *None* means that flooding is not probable; *rare* that it is unlikely but is possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is 50 percent or more in any year).

Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 to 30 days), and *very long* (more than 30 days). The time of year that flooding is most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding 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 level of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is a zone of saturation at the highest average depth during the wettest season. It is at least 6 inches thick, persists in the soil for more than a few weeks, and is within 6 feet of the surface. Indicated in the table "Water Features" are the depth to the seasonal high water table, the kind of water table, and the months of the year when the water table usually is highest.

An *apparent* water table is indicated by the level at which water stands in a freshly dug, unlined borehole after adequate time for adjustments in the surrounding soil.

A *perched* water table is one that is above an unsaturated zone in the soil. The basis for determining that a water table is perched may be general knowledge of the area. The water table is proven to be perched if the water level in a borehole is observed to fall when the borehole is extended.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. *Ponding duration* classes are the same as those for flooding. *Maximum ponding depth* refers to the depth of the water above the surface of the soil.

Soil Features

The table "Soil Features" gives estimates of several important soil features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Depth to bedrock is given if bedrock is within a depth of 60 inches. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

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 "Soil Features" shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation

or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

A *low* potential for frost action indicates that the soil is rarely susceptible to the formation of ice lenses; a *moderate* potential indicates that the soil is susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength; and a *high* potential indicates that the soil is highly susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate content, texture, moisture content, and acidity of the soil.

Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

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

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

Engineering Index Properties

(Absence of an entry indicates that the data were not estimated)

Map symbol and soil 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	
7A:												
Hubbard---------	0-20	Loamy sand-----	SM, SP-SM	A-2	0	0	98-100	95-100	50-80	10-25	15-20	NP
	20-45	Sand, coarse sand, loamy sand.	SP-SM, SW-SM	A-1, A-3, A-2-4	0	0	98-100	95-100	25-75	5-12	15-20	NP
	45-60	Sand, coarse sand.	SP, SW	A-1, A-3, A-2	0	0	95-100	85-100	20-70	2-5	15-20	NP
7B:												
Hubbard---------	0-12	Loamy sand-----	SM, SP-SM	A-2	0	0	98-100	95-100	50-80	10-25	15-20	NP
	12-42	Sand, coarse sand, loamy sand.	SP-SM, SW-SM	A-1, A-3, A-2-4	0	0	98-100	95-100	25-75	5-12	15-20	NP
	42-60	Sand, coarse sand.	SP, SW	A-1, A-3, A-2	0	0	95-100	85-100	20-70	2-5	15-20	NP
7C:												
Hubbard---------	0-9	Loamy sand-----	SM, SP-SM	A-2	0	0	98-100	95-100	50-80	10-25	15-20	NP
	9-34	Sand, coarse sand, loamy sand.	SP-SM, SW-SM	A-1, A-3, A-2-4	0	0	98-100	95-100	25-75	5-12	15-20	NP
	34-60	Sand, coarse sand.	SP, SW	A-1, A-3, A-2	0	0	95-100	85-100	20-70	2-5	15-20	NP
26:												
Aazdahl---------	0-13	Clay loam------	CL	A-7, A-6	0	0-3	95-100	90-100	85-100	75-90	35-50	15-30
	13-23	Clay loam, silty clay loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	23-36	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	36-60	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30

Engineering Index Properties--Continued

Map symbol and soil 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	
34:												
Parnell---------	0-18	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	85-100	40-60	15-30
	18-50	Clay loam, silty clay loam, silty clay.	CL, CH	A-7	0	0	100	95-100	90-100	70-100	40-80	20-50
	50-60	Clay loam, silty clay loam, silty clay.	CL, CH	A-6, A-7	0	0	95-100	90-100	80-95	70-95	30-80	15-50
38B:												
Waukon----------	0-8	Loam----------	ML, CL, CL-ML	A-6, A-4	0-1	0-3	95-100	90-100	80-95	60-90	20-40	5-20
	8-32	Clay loam, loam	CL, ML	A-6, A-7	0-1	0-3	95-100	90-100	75-95	50-85	30-45	10-20
	32-60	Loam, clay loam	ML, CL	A-6	0-1	0-3	95-100	90-100	70-95	50-80	30-40	10-20
38C2:												
Waukon----------	0-8	Loam----------	ML, CL, CL-ML	A-6, A-4	0-1	0-3	95-100	90-100	80-95	60-90	20-40	5-20
	8-27	Clay loam, loam	CL, ML	A-6, A-7	0-1	0-3	95-100	90-100	75-95	50-85	30-45	10-20
	27-60	Loam, clay loam	ML, CL	A-6	0-1	0-3	95-100	90-100	70-95	50-80	30-40	10-20
38D2:												
Waukon----------	0-7	Loam----------	ML, CL, CL-ML	A-6, A-4	0-1	0-3	95-100	90-100	80-95	60-90	20-40	5-20
	7-22	Clay loam, loam	CL, ML	A-6, A-7	0-1	0-3	95-100	90-100	75-95	50-85	30-45	10-20
	22-60	Loam, clay loam	ML, CL	A-6	0-1	0-3	95-100	90-100	70-95	50-80	30-40	10-20
38E:												
Waukon----------	0-9	Loam----------	ML, CL, CL-ML	A-6, A-4	0-1	0-3	95-100	90-100	80-95	60-90	20-40	5-20
	9-26	Clay loam, loam	CL, ML	A-6, A-7	0-1	0-3	95-100	90-100	75-95	50-85	30-45	10-20
	26-60	Loam, clay loam	ML, CL	A-6	0-1	0-3	95-100	90-100	70-95	50-80	30-40	10-20
46:												
Borup----------	0-13	Loam----------	ML	A-4	0	0	100	100	95-100	70-95	20-34	NP-7
	13-32	Very fine sandy loam, silt loam, sandy clay loam.	ML	A-4	0	0	100	100	90-100	60-95	0-30	NP-5
	32-60	Loamy very fine sand, very fine sand, very fine sandy loam.	ML	A-4	0	0	100	100	85-100	50-90	0-30	NP-5

Engineering Index Properties--Continued

Map symbol and soil 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	
53B:												
Kandota---------	0-8	Sandy loam-----	SC-SM, SC	A-4, A-6	0	0-5	95-100	75-98	65-85	35-50	21-35	4-11
	8-11	Fine sandy loam, sandy loam, loamy sand.	SM, SC-SM, SC	A-4, A-2-4	0	0-5	95-100	75-98	45-85	20-65	15-28	NP-10
	11-32	Sandy clay loam, loam, fine sandy loam.	SC, CL	A-4, A-6	0	0-10	90-100	75-98	70-85	35-55	28-39	9-18
	32-68	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0-10	85-100	75-98	65-85	35-55	23-28	4-9
	68-80	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0-10	85-100	80-95	65-85	35-55	23-28	5-10
53C:												
Kandota---------	0-8	Sandy loam-----	SC-SM, SC	A-4, A-6	0	0-5	95-100	75-98	65-85	35-50	21-35	4-11
	8-24	Sandy clay loam, loam, fine sandy loam.	SC, CL	A-4, A-6	0	0-10	90-100	75-98	70-85	35-55	28-39	9-18
	24-60	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0-10	85-100	80-95	65-85	35-55	23-28	5-10
53D:												
Kandota---------	0-7	Sandy loam-----	SC-SM, SC	A-4, A-6	0	0-5	95-100	75-98	65-85	35-50	21-35	4-11
	7-9	Fine sandy loam, sandy loam, loamy sand.	SM, SC-SM, SC	A-4, A-2-4	0	0-5	95-100	75-98	45-85	20-65	15-28	NP-10
	9-28	Sandy clay loam, loam, fine sandy loam.	SC, CL	A-4, A-6	0	0-10	90-100	75-98	70-85	35-55	28-39	9-18
	28-60	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0-10	85-100	80-95	65-85	35-55	23-28	5-10

Engineering Index Properties--Continued

Map symbol and soil 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	
58:												
Kittson---------	0-7	Loam----------	CL, CL-ML	A-6, A-4	0	0	100	95-100	85-95	50-75	20-40	5-20
	7-18	Loam, fine sandy loam, sandy loam.	CL, SC	A-6	0	0-5	90-100	65-100	60-90	40-75	20-40	10-20
	18-32	Loam, clay loam	CL	A-6	0	0-2	95-100	85-98	80-90	50-75	20-40	10-20
	32-60	Loam, clay loam	CL	A-6	0	0-2	95-100	85-98	80-90	50-75	20-40	10-20
59:												
Grimstad--------	0-10	Fine sandy loam	SM, SC-SM	A-4, A-2	0	0	100	100	80-100	15-50	15-30	NP-7
	10-27	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM	A-2, A-3	0	0	100	95-100	80-90	5-35	15-25	NP-4
	27-60	Sandy loam, fine sandy loam, loam.	SC, CL, SC-SM, CL-ML	A-4, A-6	0	0-3	95-100	85-100	70-90	40-85	15-40	5-20
61:												
Arveson---------	0-10	Loam----------	ML	A-4	0	0-1	100	95-100	85-90	50-80	20-40	NP-10
	10-30	Fine sandy loam, sandy loam, loam.	SM, SC-SM	A-4	0	0	100	95-100	60-85	35-50	0-20	NP-5
	30-60	Fine sand, loamy sand, sandy loam.	SP-SM, SM, SC-SM	A-3, A-2, A-4	0	0	100	95-100	50-80	5-45	0-20	NP-5
63:												
Rockwell--------	0-10	Loam----------	OL, ML	A-4	0	0	100	95-100	85-95	50-75	20-40	NP-10
	10-27	Fine sandy loam, sandy loam, loam.	SM, ML, SC-SM, CL-ML	A-4	0	0	100	95-100	60-85	35-55	15-25	1-7
	27-36	Fine sand, sand, loamy fine sand.	SM	A-2	0	0	100	95-100	65-80	20-35	0-14	NP
	36-60	Silt loam, loam, clay loam.	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0-1	95-100	90-100	70-90	40-85	15-40	5-20

Engineering Index Properties--Continued

Map symbol and soil 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	
65:												
Foxhome---------	0-13	Sandy loam-----	SM	A-4	0	0-2	95-100	90-100	75-90	35-50	15-30	NP-5
	13-16	Loamy sand, sandy loam, gravelly loam.	SM, SP-SM	A-2, A-4	0	0-2	95-100	70-100	45-80	10-50	20-30	NP-5
	16-35	Very gravelly sand, very gravelly coarse sand, very gravelly loamy sand.	SP, SP-SM, GP, GP-GM	A-1	0	2-5	50-75	40-60	20-50	0-10	---	NP
	35-60	Loam, clay loam, silt loam.	ML, CL, CL-ML	A-4, A-6	0	1-5	90-100	85-100	75-90	50-80	20-40	1-15
66:												
Flaming---------	0-16	Loamy fine sand	SM, SP-SM	A-2, A-3	0	0	100	100	75-90	5-30	---	NP
	16-60	Fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	0	100	100	75-90	5-30	---	NP
68:												
Arveson---------	0-16	Loam----------	ML	A-4	0	0	100	95-100	85-90	50-80	20-40	NP-10
	16-23	Fine sandy loam, sandy loam, loam.	SM, SC-SM	A-4	0	0	100	95-100	60-85	35-50	0-20	NP-5
	23-60	Fine sand, sand, sandy loam.	SP-SM, SM, SC-SM	A-3, A-2, A-4	0	0	100	95-100	50-80	5-45	0-20	NP-5
107:												
Winger----------	0-16	Silt loam------	ML, CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	20-40	2-15
	16-29	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	0	100	100	90-100	80-90	20-40	2-15
	29-60	Loam, clay loam	ML, CL, CL-ML	A-4, A-6, A-7	0	0-10	90-100	85-97	75-95	50-75	20-45	3-25
108:												
McIntosh--------	0-12	Silt loam------	CL, ML	A-4, A-6	0	0	100	100	85-100	70-95	28-36	9-15
	12-25	Silt loam, silty clay loam, loam.	ML, CL	A-4, A-6	0	0	100	100	90-100	70-90	28-43	9-21
	25-60	Loam, clay loam	CL, ML	A-6, A-4	0	0-5	95-100	90-100	80-95	60-80	28-43	9-21

Engineering Index Properties--Continued

Map symbol and soil 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	
121:												
Wykeham---------	0-8	Fine sandy loam	SM, SC-SM	A-4	0	0-5	90-100	85-100	65-80	40-50	25-30	2-5
	8-14	Fine sandy loam, loamy sand, sandy loam.	SM, SC-SM	A-4, A-2	0	0-5	85-100	70-95	65-80	25-50	15-20	1-5
	14-28	Loam, sandy clay loam, sandy loam.	SC, CL	A-6	0	0-5	90-100	85-95	70-80	35-60	30-35	10-15
	28-60	Fine sandy loam, sandy loam.	SC-SM, SC	A-4	0	0-5	85-95	85-95	65-80	35-50	20-25	5-10
127A:												
Sverdrup--------	0-7	Sandy loam-----	SM	A-4	0	0	100	95-100	60-70	35-50	---	NP
	7-17	Loam, sandy loam, loamy sand.	ML, SM	A-2, A-4	0	0	100	95-100	50-75	30-70	15-30	NP-5
	17-60	Sand, fine sand	SP, SP-SM	A-3, A-2	0	0	100	95-100	50-90	2-10	---	NP
127B:												
Sverdrup--------	0-12	Sandy loam-----	SM	A-4	0	0	100	95-100	60-70	35-50	---	NP
	12-24	Loam, sandy loam, loamy sand.	ML, SM	A-2, A-4	0	0	100	95-100	50-75	30-70	15-30	NP-5
	24-60	Sand, fine sand	SP, SP-SM	A-3, A-2	0	0	100	95-100	50-90	2-10	---	NP
127C:												
Sverdrup--------	0-8	Sandy loam-----	SM	A-4	0	0	100	95-100	60-70	35-50	---	NP
	8-15	Loam, sandy loam, loamy sand.	ML, SM	A-2, A-4	0	0	100	95-100	50-75	30-70	15-30	NP-5
	15-60	Sand, fine sand	SP, SP-SM	A-3, A-2	0	0	100	95-100	50-90	2-10	---	NP
141B:												
Egeland---------	0-15	Fine sandy loam	SM, SC-SM	A-2, A-4	0	0	100	95-100	75-100	30-50	15-25	NP-7
	15-42	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	0	95-100	85-100	70-100	15-50	15-25	NP-7
	42-60	Loamy sand, loamy fine sand, loamy very fine sand.	SM, SP-SM, SC-SM	A-2, A-4	0	0	95-100	85-100	70-100	10-45	15-25	NP-5

Engineering Index Properties--Continued

Map symbol and soil 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	
141C:												
Egeland---------	0-11	Fine sandy loam	SM, SC-SM	A-2, A-4	0	0	100	95-100	75-100	30-50	15-25	NP-7
	11-35	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	0	95-100	85-100	70-100	15-50	15-25	NP-7
	35-60	Loamy sand, loamy fine sand, loamy very fine sand.	SM, SP-SM, SC-SM	A-2, A-4	0	0	95-100	85-100	70-100	10-45	15-25	NP-5
141D:												
Egeland---------	0-9	Fine sandy loam	SM, SC-SM	A-2, A-4	0	0	100	95-100	75-100	30-50	15-25	NP-7
	9-30	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	0	95-100	85-100	70-100	15-50	15-25	NP-7
	30-60	Loamy sand, loamy fine sand, loamy very fine sand.	SM, SP-SM, SC-SM	A-2, A-4	0	0	95-100	85-100	70-100	10-45	15-25	NP-5
168B:												
Forman----------	0-9	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	85-100	70-80	30-45	10-25
	9-24	Clay loam------	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	24-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
180:												
Gonvick---------	0-15	Loam----------	ML, CL, CL-ML	A-4, A-6	0	0-3	95-100	90-100	85-95	50-75	20-40	3-20
	15-35	Loam, clay loam	CL	A-6, A-7	0	0-3	95-100	90-100	75-95	50-85	20-50	10-30
	35-60	Loam, clay loam	CL-ML, CL	A-4, A-6	0	0-3	95-100	90-100	70-95	50-80	15-40	5-20
184:												
Hamerly---------	0-10	Loam----------	CL, CL-ML	A-4, A-6	0	0-5	95-100	90-100	80-95	60-90	20-40	5-20
	10-38	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0-5	95-100	85-95	80-95	60-75	20-40	5-20
	38-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0-5	95-100	85-95	80-95	60-75	20-40	5-20

Engineering Index Properties--Continued

Map symbol and soil 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	
187:												
Haug----------	0-14	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	14-20	Mucky sandy loam, fine sandy loam, loam.	OL, ML, CL, SM	A-4, A-6	0	0-3	95-100	90-100	70-85	35-65	15-40	1-15
	20-60	Loam, sandy loam, fine sandy loam.	ML, CL, SM, SC	A-4, A-6	0	0-3	95-100	70-100	60-95	35-65	15-40	1-15
191:												
Epoufette-------	0-7	Sandy loam-----	SM, SC-SM	A-2, A-4	0	0-5	95-100	65-95	60-75	25-40	15-25	NP-7
	7-33	Gravelly sandy loam, sandy loam, gravelly loamy sand.	SM, SC-SM, SC	A-2, A-4	0	0-5	95-100	70-95	60-80	25-40	15-25	2-10
	33-60	Gravelly sand, coarse sand, sand.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2-4	0	0-10	50-90	45-85	30-60	0-10	---	NP
202:												
Meehan----------	0-8	Loamy sand-----	SM	A-2, A-1	0	0	90-100	75-100	40-90	15-30	0-14	NP
	8-24	Sand, loamy sand, loamy coarse sand.	SM, SP-SM, SP	A-1, A-2, A-3	0	0	90-100	75-100	40-90	3-30	0-14	NP
	24-60	Sand, coarse sand.	SP, SP-SM	A-1, A-3, A-2	0	0	90-100	75-100	40-90	0-5	0-14	NP
258A:												
Sandberg--------	0-11	Loamy sand-----	SM, SP-SM	A-1, A-2	0-3	0-5	85-100	50-95	40-75	10-25	---	NP-4
	11-33	Gravelly loamy coarse sand, gravelly coarse sand, loamy sand.	SP-SM, SM	A-1, A-2, A-3	0-3	0-5	75-95	50-95	35-70	5-25	---	NP-4
	33-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
258B:												
Sandberg--------	0-12	Loamy sand-----	SM, SP-SM	A-1, A-2	0-3	0-5	85-100	50-95	40-75	10-25	---	NP-4
	12-19	Gravelly loamy coarse sand, gravelly coarse sand, loamy sand.	SP-SM, SM	A-1, A-2, A-3	0-3	0-5	75-95	50-95	35-70	5-25	---	NP-4
	19-29	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
	29-80	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
258C:												
Sandberg--------	0-10	Loamy sand-----	SM, SP-SM	A-1, A-2	0-3	0-5	85-100	50-95	40-75	10-25	---	NP-4
	10-17	Gravelly loamy coarse sand, gravelly coarse sand, loamy sand.	SP-SM, SM	A-1, A-2, A-3	0-3	0-5	75-95	50-95	35-70	5-25	---	NP-4
	17-44	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
	44-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
260:												
Duelm----------	0-16	Loamy sand-----	SM, SP-SM	A-2, A-1	0	0	90-100	85-100	35-75	10-25	15-20	NP
	16-56	Loamy sand, sand, coarse sand.	SM, SP-SM	A-2, A-3, A-1	0	0	90-100	85-100	35-75	5-25	15-20	NP
	56-60	Coarse sand, sand.	SP, SM, SP-SM	A-2, A-3, A-1	0	0	85-100	75-100	35-75	3-15	15-20	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
267B:												
Snellman--------	0-9	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	9-15	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	15-31	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	31-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
267C:												
Snellman--------	0-7	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	7-15	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	15-31	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	31-45	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
	45-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10

Engineering Index Properties--Continued

Map symbol and soil 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	
267E:												
Snellman--------	0-3	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	3-14	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	14-26	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	26-39	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
	39-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
267F:												
Snellman--------	0-3	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	3-16	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	16-32	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	32-40	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
	40-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10

Engineering Index Properties--Continued

Map symbol and soil 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	
290:												
Rothsay---------	0-14	Silt loam------	ML	A-4	0	0	95-100	95-100	90-100	85-100	20-40	NP-10
	14-22	Silt loam, very fine sandy loam, loam.	ML	A-4	0	0	95-100	95-100	90-100	80-100	20-40	NP-10
	22-31	Silt loam, loam, very fine sandy loam.	ML	A-4	0	0	95-100	95-100	90-100	80-90	10-28	NP-10
	31-60	Silt loam, loam, very fine sandy loam.	ML	A-4	0	0	95-100	95-100	90-100	80-90	10-28	NP-10
293B:												
Swenoda---------	0-15	Fine sandy loam	SM	A-2, A-4	0	0	100	95-100	70-100	30-50	20-30	NP-7
	15-29	Fine sandy loam, sandy loam.	SC-SM, SM, ML, CL-ML	A-2, A-4	0	0	100	95-100	60-100	30-55	15-30	NP-10
	29-60	Silt loam, silty clay loam, loam.	CL, CL-ML	A-4, A-6, A-7	0	0-5	90-100	90-100	75-100	50-95	25-50	5-30
335:												
Urness----------	0-9	Mucky silt loam	OL, CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	70-95	20-50	3-20
	9-60	Mucky silt loam, mucky silty clay loam, silty clay loam.	ML, CL, CL-ML, OL	A-4, A-6, A-7	0	0	95-100	90-100	85-100	70-95	20-50	3-30
339:												
Fordville-------	0-10	Loam----------	ML, CL	A-4, A-6, A-7	0	0	100	100	70-85	55-75	30-45	5-20
	10-29	Loam, silt loam, clay loam.	CL, ML	A-4, A-6, A-7	0	0	100	95-100	70-95	55-80	30-45	5-20
	29-37	Loam, clay loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0	0	95-100	90-100	65-90	40-55	25-40	3-15
	37-60	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM	A-1	0	0	65-85	45-70	15-45	0-15	15-25	NP-5

Engineering Index Properties--Continued

Map symbol and soil 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	
341A:												
Arvilla---------	0-13	Sandy loam-----	SM, SC, SC-SM	A-2, A-4, A-6	0	0	95-100	90-100	50-80	20-45	15-30	NP-15
	13-20	Sandy loam, loam, coarse sandy loam.	SM, SC, SC-SM	A-2, A-4, A-6	0	0	90-100	85-100	50-80	20-45	15-40	NP-15
	20-60	Gravelly coarse sand, coarse sand, very gravelly coarse sand.	SP-SM, GM, SP, GP-GM	A-1, A-2, A-3	0	0	35-100	25-100	10-60	0-15	---	NP
341B:												
Arvilla---------	0-9	Sandy loam-----	SM, SC, SC-SM	A-2, A-4, A-6	0	0	95-100	90-100	50-80	20-45	15-30	NP-15
	9-19	Sandy loam, loam, coarse sandy loam.	SM, SC, SC-SM	A-2, A-4, A-6	0	0	90-100	85-100	50-80	20-45	15-40	NP-15
	19-60	Gravelly coarse sand, coarse sand, very gravelly coarse sand.	SP-SM, GM, SP, GP-GM	A-1, A-2, A-3	0	0	35-100	25-100	10-60	0-15	---	NP
371:												
Clontarf--------	0-13	Sandy loam-----	SM	A-2, A-4	0	0	100	95-100	60-85	25-50	15-30	NP-10
	13-24	Sandy loam, loam, fine sandy loam.	SM, ML	A-2, A-4	0	0	100	95-100	60-95	20-60	15-30	NP-10
	24-60	Sand, fine sand, loamy sand.	SP-SM, SM	A-2, A-3	0	0	100	95-100	50-80	5-35	15-20	NP-5
375:												
Forada----------	0-18	Loam----------	ML	A-4	0	0	95-100	85-100	70-90	50-70	25-35	5-20
	18-36	Sandy loam, loam, fine sandy loam.	ML, SM	A-4, A-2	0	0	95-100	85-100	55-85	30-60	15-30	NP-10
	36-60	Sand, gravelly coarse sand, loamy sand.	SP, SM, SP-SM, GP-GM	A-1, A-2, A-3	0	0	50-100	50-100	40-70	5-30	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
402C:												
Sioux----------	0-10	Loamy sand-----	SM, SC-SM	A-1	0	0-5	95-100	90-100	25-50	15-30	0-25	NP-5
	10-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0	0	25-75	20-60	5-35	0-25	0-25	NP-5
402E:												
Sioux----------	0-10	Loamy sand-----	SM, SC-SM	A-1	0	0-5	95-100	90-100	25-50	15-30	0-25	NP-5
	10-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0	0	25-75	20-60	5-35	0-25	0-25	NP-5
406A:												
Dorset----------	0-11	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	11-20	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	20-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
406B:												
Dorset----------	0-11	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	11-20	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	20-38	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	38-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
418:												
Lamoure---------	0-32	Silty clay loam	CL, CH, MH, ML	A-7	0	0	100	100	95-100	85-100	40-70	15-35
	32-40	Silty clay loam, silt loam.	CL, CH, MH, ML	A-7	0	0	100	100	90-100	60-100	40-70	15-35
	40-48	Silty clay loam, silt loam, loam.	CL, ML	A-6, A-7	0	0	95-100	95-100	90-100	60-100	30-70	10-35
	48-60	Stratified sandy loam to silty clay loam.	CL, SC	A-6, A-7	0	0	95-100	95-100	70-95	35-90	30-70	10-35
422B:												
Bygland---------	0-10	Silty clay loam	CL, ML	A-7, A-6	0	0	100	100	95-100	95-100	35-50	15-25
	10-41	Silty clay, clay, silty clay loam.	CH, CL, MH	A-7	0	0	100	100	95-100	85-100	45-70	20-45
	41-46	Silty clay loam, silt loam, silty clay.	CL, CH	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30
	46-60	Stratified silty clay loam to silt loam.	CL, CH	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30
422C:												
Bygland---------	0-8	Silty clay loam	CL, ML	A-7, A-6	0	0	100	100	95-100	95-100	35-50	15-25
	8-16	Silty clay, clay, silty clay loam.	CH, CL, MH	A-7	0	0	100	100	95-100	85-100	45-70	20-45
	16-22	Silty clay loam, silt loam, silty clay.	CL, CH	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30
	22-60	Stratified silty clay loam to silt loam.	CL, CH	A-6, A-7	0	0	100	100	90-100	80-95	25-50	10-30

Engineering Index Properties--Continued

Map symbol and soil 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	
426:												
Foldahl---------	0-14	Loamy fine sand	SM, SP-SM	A-2	0	0	100	95-100	70-85	12-35	---	NP
	14-26	Fine sand, loamy fine sand, sand.	SP-SM, SM	A-2, A-3	0-1	0-3	95-100	90-100	70-85	5-35	---	NP
	26-40	Loam, clay loam	CL-ML, CL	A-4, A-6	0-1	1-5	95-100	75-95	70-90	50-85	15-40	5-20
	40-60	Loam, clay loam	CL-ML, CL	A-4, A-6	0-1	1-5	95-100	75-95	70-90	50-85	15-40	5-20
441A:												
Almora----------	0-11	Loam----------	SC, SC-SM, CL-ML	A-4	0	0	95-100	85-100	45-85	45-75	23-30	6-11
	11-15	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0	95-100	85-100	45-85	35-65	23-30	6-11
	15-38	Sandy clay loam, gravelly sandy clay loam, loam.	SC, ML, CL	A-4, A-6	0	0-5	95-100	60-98	40-80	40-75	34-39	9-18
	38-46	Gravelly loamy coarse sand, sand, loamy sand.	SM, SP-SM, SC-SM	A-1-a, A-1-b, A-3	0	0-5	90-100	30-98	20-70	5-20	15-20	NP-6
	46-60	Gravelly coarse sand, sand, coarse sand.	SW, SP-SM, SP	A-1-a, A-1-b	0	0-5	90-100	30-98	5-30	0-10	---	NP
441B:												
Almora----------	0-9	Loam----------	SC, SC-SM, CL-ML	A-4	0	0	95-100	85-100	45-85	45-75	23-30	6-11
	9-13	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0	95-100	85-100	45-85	35-65	23-30	6-11
	13-27	Sandy clay loam, gravelly sandy clay loam, loam.	SC, ML, CL	A-4, A-6	0	0-5	95-100	60-98	40-80	40-75	34-39	9-18
	27-60	Gravelly coarse sand, sand, coarse sand.	SW, SP-SM, SP	A-1-a, A-1-b	0	0-5	90-100	30-98	5-30	0-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
441C:												
Almora----------	0-10	Loam----------	SC, SC-SM, CL-ML	A-4	0	0	95-100	85-100	45-85	45-75	23-30	6-11
	10-13	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0	95-100	85-100	45-85	35-65	23-30	6-11
	13-33	Sandy clay loam, gravelly sandy clay loam, loam.	SC, ML, CL	A-4, A-6	0	0-5	95-100	60-98	40-80	40-75	34-39	9-18
	33-60	Gravelly coarse sand, sand, coarse sand.	SW, SP-SM, SP	A-1-a, A-1-b	0	0-5	90-100	30-98	5-30	0-10	---	NP
481:												
Kratka----------	0-9	Fine sandy loam	SM, SC-SM	A-4	0	0	95-100	90-100	50-80	36-50	15-25	2-6
	9-25	Loamy sand, sand, loamy fine sand.	SP-SM	A-3, A-2	0	0	95-100	90-100	50-80	5-10	---	NP
	25-60	Loam, clay loam	CL-ML, CL	A-4, A-6	0	0	95-100	90-100	75-100	55-80	21-43	5-21
494:												
Darnen----------	0-36	Loam----------	OL, ML, CL, CL-ML	A-4	0	0	100	100	85-100	60-90	20-35	2-10
	36-43	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0	100	100	85-100	60-90	20-45	5-25
	43-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0	90-100	90-100	80-95	60-85	20-45	5-25
497:												
Hantho----------	0-9	Silt loam------	ML	A-4, A-6	0	0	100	98-100	90-100	85-100	21-36	4-15
	9-22	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0	100	98-100	90-100	80-100	21-36	4-9
	22-31	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	0	100	98-100	90-100	80-100	21-36	4-9
	31-60	Silt loam, very fine sandy loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	0	100	98-100	90-100	80-100	21-36	4-21

Engineering Index Properties--Continued

Map symbol and soil 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	
508:												
Wyndmere--------	0-12	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-2, A-4	0	0	100	100	60-80	30-55	15-25	NP-10
	12-38	Sandy loam, fine sandy loam.	SM, ML, SC, SC-SM	A-2, A-4	0	0	100	100	60-90	30-55	15-25	NP-10
	38-60	Fine sand, loamy fine sand, fine sandy loam.	SM, ML, SC-SM	A-2, A-4	0	0	100	100	60-100	20-55	15-25	NP-10
540:												
Seelyeville-----	0-8	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	8-80	Muck, mucky peat.	PT	A-8	0	0	0	0	0	0	---	NP
541:												
Rifle----------	0-21	Mucky peat-----	PT	A-8	0	0	0	0	0	0	---	NP
	21-80	Mucky peat-----	PT	A-8	0	0	0	0	0	0	---	NP
544:												
Cathro----------	0-16	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	16-38	Sapric material	PT	A-8	0	0	0	0	0	0	---	NP
	38-60	Sandy loam, loam, clay loam.	CL-ML, SC-SM, SC, CL	A-4, A-6	0	0-5	85-100	75-100	60-100	35-90	20-40	5-20
567A:												
Verndale--------	0-9	Sandy loam-----	SM, SC-SM	A-4, A-2-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	9-21	Sandy loam, fine sandy loam, loam.	SC, SC-SM	A-4, A-2-4	0	0	98-100	85-100	60-85	25-45	20-26	5-10
	21-38	Sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP-2
	38-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1-b, A-2-4	0	0	96-100	75-100	45-60	3-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
567B:												
Verndale--------	0-10	Sandy loam-----	SM, SC-SM	A-4, A-2-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	10-18	Sandy loam, fine sandy loam, loam.	SC, SC-SM	A-4, A-2-4	0	0	98-100	85-100	60-85	25-45	20-26	5-10
	18-29	Sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP-2
	29-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1-b, A-2-4	0	0	96-100	75-100	45-60	3-10	---	NP
609B:												
Dickey----------	0-13	Loamy fine sand	SM	A-2-4	0	0	100	100	50-75	15-30	0-14	NP
	13-28	Loamy fine sand, loamy sand, fine sand.	SM	A-2-4	0	0	100	100	50-80	15-35	0-14	NP
	28-60	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0-5	95-100	90-100	85-100	60-90	24-40	4-20
624:												
Rosy----------	0-9	Sandy loam-----	ML, SM, CL-ML, SC-SM	A-4	0	0	100	95-100	70-95	40-65	15-25	NP-6
	9-26	Loam, very fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SC	A-4, A-6	0	0	100	95-100	70-95	40-75	20-35	3-12
	26-60	Stratified sand to silty clay loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0	95-100	95-100	60-95	30-75	15-35	2-12
646C:												
Peever----------	0-9	Clay loam------	CL	A-6, A-7	0	0	100	95-100	90-100	65-90	35-50	12-25
	9-18	Clay, silty clay, clay loam.	CL, CH, MH, ML	A-7	0	0	100	95-100	85-100	70-85	40-65	15-30
	18-37	Clay loam, clay	CL, CH, MH, ML	A-7	0	0-5	95-100	90-100	85-100	70-85	40-65	15-30
	37-60	Clay loam, clay	CL, CH, MH, ML	A-7	0	0-5	95-100	90-100	85-100	70-85	40-65	15-30

Engineering Index Properties--Continued

Map symbol and soil 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	
646D:												
Peever----------	0-8	Clay loam------	CL	A-6, A-7	0	0	100	95-100	90-100	65-90	35-50	12-25
	8-21	Clay, silty clay, clay loam.	CL, CH, MH, ML	A-7	0	0	100	95-100	85-100	70-85	40-65	15-30
	21-60	Clay loam, clay	CL, CH, MH, ML	A-7	0	0-5	95-100	90-100	85-100	70-85	40-65	15-30
670:												
Knute----------	0-9	Fine sandy loam	SM, SC, SC-SM	A-2-4, A-4	0	0-5	95-100	85-95	50-80	30-50	20-30	2-10
	9-22	Sandy clay loam, loam, fine sandy loam.	CL	A-4, A-6	0	0-5	95-100	85-95	55-85	55-70	30-40	8-20
	22-29	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-6	0	0-5	95-100	85-95	50-85	35-65	20-30	3-12
	29-60	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-6	0	0-5	95-100	85-95	50-85	35-65	15-25	3-12
680:												
Parnell---------	0-27	Silt loam------	OL, ML, CL	A-4, A-6	0	0	100	100	85-100	60-85	25-40	2-15
	27-49	Clay loam, silty clay loam, silty clay.	CL, CH	A-7	0	0-2	97-100	95-100	90-100	70-100	40-80	20-50
	49-60	Clay loam, silty clay loam, loam.	CL, CH	A-6, A-7	0	0-2	95-100	92-100	80-95	70-95	35-60	15-40
698:												
Doran----------	0-9	Clay loam------	CH, CL	A-6, A-7	0	0	100	100	95-100	65-95	30-60	11-35
	9-19	Clay, clay loam, silty clay.	CH, CL	A-7, A-6	0	0	100	95-100	90-95	70-90	35-75	15-50
	19-32	Clay loam, loam	CL	A-6, A-7	0	0-3	100	90-95	85-90	70-80	30-50	11-30
	32-60	Clay loam, loam	CL	A-6, A-7	0	0-3	95-100	85-95	70-90	50-80	25-50	11-30
701:												
Runeberg--------	0-10	Mucky loam-----	ML, CL	A-4, A-6	0-1	2-5	95-100	90-95	80-90	50-80	30-40	5-15
	10-36	Sandy loam-----	SM, SC, SC-SM	A-2, A-4	0-1	5-10	85-95	80-95	60-75	30-45	15-25	3-10
	36-60	Sandy loam-----	SM, SC-SM, SC	A-2, A-4	0-1	5-10	85-95	80-95	60-75	30-45	15-25	3-8

Engineering Index Properties--Continued

Map symbol and soil 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	
705B:												
Nitche----------	0-16	Sandy loam-----	SM, SC-SM, CL-ML, ML	A-4, A-2-4	0	0	95-100	85-100	50-90	15-90	15-25	3-9
	16-24	Gravelly sandy loam, sandy loam, loam.	SM, SC-SM, CL-ML, CL	A-1-b, A-4, A-6	0	0-1	55-100	50-100	30-85	10-75	15-30	3-9
	24-33	Loamy sand, loamy coarse sand, gravelly loamy sand.	SP-SM, SM, GP-GM, GM	A-1-b, A-3, A-2-4	0	0-1	50-100	50-100	10-75	5-50	0-20	NP-5
	33-55	Gravelly sand, coarse sand, gravelly loamy sand.	SP-SM, GP-GM, SM, GM	A-1-a, A-1-b, A-3	0	0-1	50-100	50-100	50-55	5-35	0-15	NP
	55-80	Loam, sandy loam, fine sandy loam.	SC-SM, SM, CL-ML, ML	A-4	0-1	0-5	85-100	75-98	65-85	35-55	21-28	4-9
Kandota---------	0-7	Sandy loam-----	SC-SM, SC	A-4, A-6	0	0-5	95-100	75-98	65-85	35-50	21-35	4-11
	7-11	Fine sandy loam, sandy loam, loamy sand.	SM, SC-SM, SC	A-4, A-2-4	0	0-5	95-100	75-98	45-85	20-65	15-28	NP-10
	11-28	Sandy clay loam, loam, fine sandy loam.	SC, CL	A-4, A-6	0	0-10	90-100	75-98	70-85	35-55	28-39	9-18
	28-48	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0-10	85-100	75-98	65-85	35-55	23-28	4-9
	48-80	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0-10	85-100	80-95	65-85	35-55	23-28	5-10

Engineering Index Properties--Continued

Map symbol and soil 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	
705B:												
Lida----------	0-9	Sandy loam-----	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	9-19	Loamy sand, loamy coarse sand, sandy loam.	SM, SP-SM	A-4, A-3, A-2-4	0	0-10	85-100	85-100	30-85	10-55	0-25	NP-7
	19-28	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	28-60	Gravelly coarse sand, sand, gravelly sand.	GP, GW, GP-GM, SP	A-3, A-1-b, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP
705C:												
Nitche----------	0-15	Sandy loam-----	SM, SC-SM, CL-ML, ML	A-4, A-2-4	0	0	95-100	85-100	50-90	15-90	15-25	3-9
	15-23	Gravelly sandy loam, sandy loam, loam.	SM, SC-SM, CL-ML, CL	A-1-b, A-4, A-6	0	0-1	55-100	50-100	30-85	10-75	15-30	3-9
	23-41	Loamy sand, loamy coarse sand, gravelly loamy sand.	SP-SM, SM, GP-GM, GM	A-1-b, A-3, A-2-4	0	0-1	50-100	50-100	10-75	5-50	0-20	NP-5
	41-60	Loam, sandy loam, fine sandy loam.	SC-SM, SM, CL-ML, ML	A-4	0-1	0-5	85-100	75-98	65-85	35-55	21-28	4-9
Kandota---------	0-7	Sandy loam-----	SC-SM, SC	A-4, A-6	0	0-5	95-100	75-98	65-85	35-50	21-35	4-11
	7-13	Fine sandy loam, sandy loam, loamy sand.	SM, SC-SM, SC	A-4, A-2-4	0	0-5	95-100	75-98	45-85	20-65	15-28	NP-10
	13-33	Sandy clay loam, loam, fine sandy loam.	SC, CL	A-4, A-6	0	0-10	90-100	75-98	70-85	35-55	28-39	9-18
	33-47	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0-10	85-100	75-98	65-85	35-55	23-28	4-9
	47-60	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0-10	85-100	80-95	65-85	35-55	23-28	5-10

Engineering Index Properties--Continued

Map symbol and soil 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	
705C:												
Lida----------	0-6	Sandy loam-----	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	6-17	Loamy sand, loamy coarse sand, sandy loam.	SM, SP-SM	A-4, A-3, A-2-4	0	0-10	85-100	85-100	30-85	10-55	0-25	NP-7
	17-28	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	28-60	Gravelly coarse sand, sand, gravelly sand.	GP, GW, GP-GM, SP	A-3, A-1-b, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP
707B:												
Lizzie----------	0-9	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	97-100	85-100	60-90	28-32	9-13
	9-26	Silt loam, silty clay loam, loam.	CL, ML	A-4, A-6	0	0	100	97-100	80-100	75-95	28-43	9-21
	26-32	Silt loam, loam, fine sandy loam.	CL, CL-ML	A-4, A-6	0	0	100	97-100	85-100	60-90	15-30	NP-11
	32-60	Very fine sandy loam, silt loam, loamy very fine sand.	CL-ML, SM, SC-SM	A-2-4, A-4	0	0	100	97-100	65-95	15-90	15-26	NP-8
707C2:												
Lizzie----------	0-10	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	97-100	85-100	60-90	28-32	9-13
	10-35	Silt loam, silty clay loam, loam.	CL, ML	A-4, A-6	0	0	100	97-100	80-100	75-95	28-43	9-21
	35-40	Silt loam, loam, fine sandy loam.	CL, CL-ML	A-4, A-6	0	0	100	97-100	85-100	60-90	15-30	NP-11
	40-80	Very fine sandy loam, silt loam, loamy very fine sand.	CL-ML, SM, SC-SM	A-2-4, A-4	0	0	100	97-100	65-95	15-90	15-26	NP-8

Engineering Index Properties--Continued

Map symbol and soil 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	
707D2:												
Lizzie----------	0-8	Silt loam------	CL-ML, CL	A-4, A-6	0	0	100	97-100	85-100	60-90	28-32	9-13
	8-21	Silt loam, silty clay loam, loam.	CL, ML	A-4, A-6	0	0	100	97-100	80-100	75-95	28-43	9-21
	21-35	Silt loam, loam, fine sandy loam.	CL, CL-ML	A-4, A-6	0	0	100	97-100	85-100	60-90	15-30	NP-11
	35-60	Very fine sandy loam, silt loam, loamy very fine sand.	CL-ML, SM, SC-SM	A-2-4, A-4	0	0	100	97-100	65-95	15-90	15-26	NP-8
710:												
Friberg---------	0-19	Loam----------	CL-ML, CL	A-6, A-4	0-1	0-2	98-100	95-98	85-98	60-85	21-34	4-14
	19-47	Clay loam, sandy clay loam, loam.	CL	A-6, A-4	0-1	0-5	95-100	90-98	70-95	50-80	28-43	9-21
	47-60	Loam, fine sandy loam, sandy loam.	SC, SC-SM, CL-ML	A-4, A-6	0-1	1-5	95-100	80-95	50-80	35-65	21-32	4-13
Weetown---------	0-9	Fine sandy loam	SC-SM, SC	A-4, A-2	0-1	0-5	95-100	85-95	50-80	30-50	21-30	4-11
	9-31	Fine sandy loam, sandy loam, loam.	SC-SM, SC, CL-ML	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	21-32	4-13
	31-51	Sandy clay loam, fine sandy loam, loam.	CL	A-4, A-6	0-1	0-5	95-100	85-95	55-85	55-70	28-37	9-16
	51-60	Sandy loam, fine sandy loam, loam.	SC-SM, SC, CL-ML	A-4	0-1	0-5	95-100	85-95	50-85	35-65	21-28	4-9
711B:												
Arvilla---------	0-13	Sandy loam-----	SM, SC, SC-SM	A-2, A-4, A-6	0	0	95-100	90-100	50-80	20-45	15-30	NP-15
	13-19	Sandy loam, loam, coarse sandy loam.	SM, SC, SC-SM	A-2, A-4, A-6	0	0	90-100	85-100	50-80	20-45	15-40	NP-15
	19-60	Gravelly coarse sand, coarse sand, very gravelly coarse sand.	SP-SM, GM, SP, GP-GM	A-1, A-2, A-3	0	0	35-100	25-100	10-60	0-15	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
711B:												
Sandberg--------	0-12	Coarse sandy loam.	SM	A-2	0-3	0-5	85-100	50-95	50-65	25-35	15-20	NP-7
	12-20	Gravelly loamy coarse sand, gravelly coarse sand, loamy sand.	SP-SM, SM	A-1, A-2, A-3	0-3	0-5	75-95	50-95	35-70	5-25	---	NP-4
	20-32	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
	32-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
711C:												
Arvilla---------	0-8	Sandy loam-----	SM, SC, SC-SM	A-2, A-4, A-6	0	0	95-100	90-100	50-80	20-45	15-30	NP-15
	8-15	Sandy loam, loam, coarse sandy loam.	SM, SC, SC-SM	A-2, A-4, A-6	0	0	90-100	85-100	50-80	20-45	15-40	NP-15
	15-60	Gravelly coarse sand, coarse sand, very gravelly coarse sand.	SP-SM, GM, SP, GP-GM	A-1, A-2, A-3	0	0	35-100	25-100	10-60	0-15	---	NP
Sandberg--------	0-7	Coarse sandy loam.	SM	A-2	0-3	0-5	85-100	50-95	50-65	25-35	15-20	NP-7
	7-14	Gravelly loamy coarse sand, gravelly coarse sand, loamy sand.	SP-SM, SM	A-1, A-2, A-3	0-3	0-5	75-95	50-95	35-70	5-25	---	NP-4
	14-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
715:												
Bluffcreek------	0-8	Sandy loam-----	SM, SC-SM	A-4, A-2-4, A-1-b	0	0-1	95-100	75-100	40-85	25-45	15-25	2-10
	8-26	Loamy sand, sand, loamy coarse sand.	SM, SP-SM	A-3, A-1-b, A-2-4	0	0-1	90-100	75-100	35-75	10-35	0-20	NP-5
	26-42	Sandy loam, coarse sandy loam, gravelly sandy loam.	SM, SC-SM, SC, CL	A-2-4, A-4, A-1-b	0	0	60-95	50-95	30-80	25-70	20-30	3-12
	42-80	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM, SW, GP	A-2, A-3, A-1-b	0	0	50-95	50-95	20-55	2-15	---	NP
Clearriver------	0-9	Loamy coarse sand.	SM, SP-SM	A-2	0	0	95-100	85-100	40-90	10-35	15-25	NP-10
	9-48	Sand, loamy sand.	SP-SM, SM	A-2, A-3	0	0	95-100	85-100	55-80	5-20	---	NP
	48-60	Stratified fine sand to gravelly coarse sand.	SP-SM, SP	A-2, A-3, A-1	0	0-2	75-100	65-85	40-65	0-10	---	NP
716B:												
Leaflake--------	0-8	Loamy sand-----	SM	A-2-4, A-1-b	0	0	100	93-100	45-70	20-35	---	NP
	8-26	Sand, fine sand, loamy sand.	SP-SM, SM	A-2-4	0	0	100	93-100	65-90	10-20	---	NP
	26-51	Sandy loam, loam, sandy clay loam.	SC, CL	A-4, A-6	0	0-10	90-100	75-98	70-85	35-55	25-37	7-16
	51-60	Sandy loam, loam.	SC-SM, SC, CL-ML	A-4	0	0-10	85-100	75-98	65-85	35-55	21-28	4-9
Eagleview-------	0-9	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	9-36	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	36-54	Sand, coarse sand, loamy sand.	SP, SP-SM, SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	54-60	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
716C:												
Leaflake--------	0-3	Loamy sand-----	SM	A-2-4, A-1-b	0	0	100	93-100	45-70	20-35	---	NP
	3-34	Sand, fine sand, loamy sand.	SP-SM, SM	A-2-4	0	0	100	93-100	65-90	10-20	---	NP
	34-71	Sandy loam, loam, sandy clay loam.	SC, CL	A-4, A-6	0	0-10	90-100	75-98	70-85	35-55	25-37	7-16
	71-80	Sandy loam, loam.	SC-SM, SC, CL-ML	A-4	0	0-10	85-100	75-98	65-85	35-55	21-28	4-9
Eagleview-------	0-3	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	3-46	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	46-78	Sand, coarse sand, loamy sand.	SP, SP-SM, SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	78-80	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP
716D:												
Leaflake--------	0-6	Loamy sand-----	SM	A-2-4, A-1-b	0	0	100	93-100	45-70	20-35	---	NP
	6-23	Sand, fine sand, loamy sand.	SP-SM, SM	A-2-4	0	0	100	93-100	65-90	10-20	---	NP
	23-39	Sandy loam, loam, sandy clay loam.	SC, CL	A-4, A-6	0	0-10	90-100	75-98	70-85	35-55	25-37	7-16
	39-60	Sandy loam, loam.	SC-SM, SC, CL-ML	A-4	0	0-10	85-100	75-98	65-85	35-55	21-28	4-9
Eagleview-------	0-3	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	3-42	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	42-60	Sand, coarse sand, loamy sand.	SP, SP-SM, SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
718E:												
Naytahwaush-----	0-5	Loam----------	CL, ML	A-6	0	0-5	95-100	90-100	75-90	60-90	30-40	10-15
	5-10	Loam, silt loam, fine sandy loam.	CL, ML	A-4, A-6	0	0-5	95-100	90-100	65-90	50-80	25-40	5-20
	10-31	Clay, silty clay, clay loam.	CL, CH	A-7	0	0-5	95-100	90-100	75-95	70-90	45-65	25-40
	31-60	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	0-5	95-100	90-100	75-95	60-90	35-50	15-25
721B:												
Corliss---------	0-8	Loamy sand-----	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	8-19	Loamy sand, gravelly sand, coarse sand.	SP-SM, SM, SP	A-1-b, A-2-4, A-3	0	0-5	75-95	50-85	35-70	2-25	15-21	NP-4
	19-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP
721C:												
Corliss---------	0-7	Loamy sand-----	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	7-28	Loamy sand, gravelly sand, coarse sand.	SP-SM, SM, SP	A-1-b, A-2-4, A-3	0	0-5	75-95	50-85	35-70	2-25	15-21	NP-4
	28-80	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP
721D:												
Corliss---------	0-6	Loamy sand-----	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	6-20	Loamy sand, gravelly sand, coarse sand.	SP-SM, SM, SP	A-1-b, A-2-4, A-3	0	0-5	75-95	50-85	35-70	2-25	15-21	NP-4
	20-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
721E:												
Corliss---------	0-2	Loamy sand-----	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	2-22	Loamy sand, gravelly sand, coarse sand.	SP-SM, SM, SP	A-1-b, A-2-4, A-3	0	0-5	75-95	50-85	35-70	2-25	15-21	NP-4
	22-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP
726:												
Kratka----------	0-8	Fine sandy loam	SM, SC-SM	A-4	0	0	95-100	90-100	50-80	36-50	0-25	NP-7
	8-33	Loamy sand, loamy fine sand, sand.	SP-SM	A-3, A-2	0	0	95-100	90-100	50-80	5-10	0-20	NP-4
	33-60	Loam, clay loam, sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0-3	95-100	85-96	70-90	40-60	21-43	4-21
746:												
Haslie----------	0-21	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	21-24	Sapric material, muck.	PT	A-8	0	0	0	0	0	0	---	NP
	24-60	Coprogenous earth, mucky silt loam.	OL	A-5	0	0	100	95-100	85-100	75-96	41-50	2-10
760C2:												
Chapett---------	0-7	Loam----------	ML, CL, CL-ML	A-4, A-6	0-1	0-5	95-100	85-95	55-85	50-70	15-30	3-15
	7-19	Sandy clay loam, sandy loam, loam.	ML, CL	A-4, A-6	0-1	0-5	95-100	85-95	55-85	55-70	20-40	8-20
	19-27	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
	27-60	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
Sisseton--------	0-7	Loam----------	ML, CL	A-4, A-6	0	0-5	95-100	90-100	90-100	60-75	30-40	5-15
	7-22	Loam, silt loam	ML, CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-100	60-90	20-40	3-15
	22-60	Stratified silt loam to sandy loam.	ML, CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	70-95	50-75	20-35	NP-15

Engineering Index Properties--Continued

Map symbol and soil 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	
760D2:												
Chapett---------	0-7	Loam----------	ML, CL, CL-ML	A-4, A-6	0-1	0-5	95-100	85-95	55-85	50-70	15-30	3-15
	7-15	Sandy clay loam, sandy loam, loam.	ML, CL	A-4, A-6	0-1	0-5	95-100	85-95	55-85	55-70	20-40	8-20
	15-23	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
	23-60	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
Sisseton--------	0-8	Loam----------	ML, CL	A-4, A-6	0	0-5	95-100	90-100	90-100	60-75	30-40	5-15
	8-16	Loam, silt loam	ML, CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-100	60-90	20-40	3-15
	16-60	Stratified silt loam to sandy loam.	ML, CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	70-95	50-75	20-35	NP-15
769B:												
Mehurin---------	0-13	Clay loam------	CL	A-6, A-7	0	0-4	95-100	90-98	50-90	50-80	35-40	15-20
	13-26	Clay loam, silty clay, clay.	CL, CH, MH	A-7	0	0-4	95-100	90-98	50-90	50-90	45-65	20-40
	26-34	Clay loam, loam	CL	A-6, A-7	0	0-4	95-100	90-98	45-90	45-80	30-45	10-20
	34-60	Clay loam, loam	CL	A-6, A-7	0	0-4	95-100	90-98	45-90	45-80	30-45	10-20
776B:												
Snellman--------	0-3	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	3-12	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	12-32	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	32-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10

Engineering Index Properties--Continued

Map symbol and soil 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	
776B:												
Sugarbush-------	0-3	Sandy loam-----	SM	A-2-4	0-1	0-10	95-100	90-100	55-70	25-35	15-20	NP-4
	3-17	Loamy sand, loamy coarse sand.	SM, SP-SM	A-1-b, A-2-4	0-1	0-10	95-100	90-100	40-70	10-25	---	NP
	17-28	Sandy loam, coarse sandy loam.	SM	A-2-4	0-1	0-10	95-100	90-100	50-70	25-35	15-20	NP-4
	28-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM	A-1-b, A-2-4, A-3	0-1	0-10	55-85	50-75	30-55	2-10	---	NP
776C:												
Snellman--------	0-2	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	2-16	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	16-32	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	32-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
Sugarbush-------	0-2	Sandy loam-----	SM	A-2-4	0-1	0-10	95-100	90-100	55-70	25-35	15-20	NP-4
	2-14	Loamy sand, loamy coarse sand.	SM, SP-SM	A-1-b, A-2-4	0-1	0-10	95-100	90-100	40-70	10-25	---	NP
	14-21	Sandy loam, coarse sandy loam.	SM	A-2-4	0-1	0-10	95-100	90-100	50-70	25-35	15-20	NP-4
	21-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM	A-1-b, A-2-4, A-3	0-1	0-10	55-85	50-75	30-55	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
776E:												
Snellman--------	0-3	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	3-14	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	14-26	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	26-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
Sugarbush-------	0-2	Sandy loam-----	SM	A-2-4	0-1	0-10	95-100	90-100	55-70	25-35	15-20	NP-4
	2-10	Loamy sand, loamy coarse sand.	SM, SP-SM	A-1-b, A-2-4	0-1	0-10	95-100	90-100	40-70	10-25	---	NP
	10-19	Sandy loam, coarse sandy loam.	SM	A-2-4	0-1	0-10	95-100	90-100	50-70	25-35	15-20	NP-4
	19-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM	A-1-b, A-2-4, A-3	0-1	0-10	55-85	50-75	30-55	2-10	---	NP
777C2:												
Sisseton--------	0-9	Loam----------	ML, CL	A-4, A-6	0	0-5	95-100	90-100	90-100	60-75	30-40	5-15
	9-19	Loam, silt loam	ML, CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-100	60-90	20-40	3-15
	19-60	Stratified silt loam to sandy loam.	ML, CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	70-95	50-75	20-35	NP-15
Heimdal---------	0-7	Loam----------	ML, CL, CL-ML	A-4, A-6	0-1	0-1	95-100	85-95	55-85	50-70	20-35	3-15
	7-17	Loam, fine sandy loam, sandy loam.	SM, SC, ML, CL	A-4, A-6	0-1	0-1	95-100	85-95	50-80	35-65	15-30	3-15
	17-34	Fine sandy loam, loam, sandy loam.	SM, SC, ML, CL	A-4, A-6	0-1	0-1	95-100	85-95	50-80	35-65	15-30	2-12
	34-60	Fine sandy loam, loam, sandy loam.	SM, SC, ML, CL	A-4, A-6	0-1	0-3	95-100	85-95	50-80	35-65	15-30	2-12

Engineering Index Properties--Continued

Map symbol and soil 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	
777D2:												
Sisseton--------	0-8	Loam----------	ML, CL	A-4, A-6	0	0-5	95-100	90-100	90-100	60-75	30-40	5-15
	8-16	Loam, silt loam	ML, CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-100	60-90	20-40	3-15
	16-60	Stratified silt loam to sandy loam.	ML, CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	70-95	50-75	20-35	NP-15
Heimdal---------	0-8	Loam----------	ML, CL, CL-ML	A-4, A-6	0-1	0-1	95-100	85-95	55-85	50-70	20-35	3-15
	8-12	Loam, fine sandy loam, sandy loam.	SM, SC, ML, CL	A-4, A-6	0-1	0-1	95-100	85-95	50-80	35-65	15-30	3-15
	12-25	Fine sandy loam, loam, sandy loam.	SM, SC, ML, CL	A-4, A-6	0-1	0-1	95-100	85-95	50-80	35-65	15-30	2-12
	25-60	Fine sandy loam, loam, sandy loam.	SM, SC, ML, CL	A-4, A-6	0-1	0-3	95-100	85-95	50-80	35-65	15-30	2-12
777E:												
Sisseton--------	0-3	Loam----------	ML, CL	A-4, A-6	0	0-5	95-100	90-100	90-100	60-75	30-40	5-15
	3-12	Loam, silt loam	ML, CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-100	60-90	20-40	3-15
	12-60	Stratified silt loam to sandy loam.	ML, CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	70-95	50-75	20-35	NP-15
Heimdal---------	0-8	Loam----------	ML, CL, CL-ML	A-4, A-6	0-1	0-1	95-100	85-95	55-85	50-70	20-35	3-15
	8-12	Loam, fine sandy loam, sandy loam.	SM, SC, ML, CL	A-4, A-6	0-1	0-1	95-100	85-95	50-80	35-65	15-30	3-15
	12-19	Fine sandy loam, loam, sandy loam.	SM, SC, ML, CL	A-4, A-6	0-1	0-1	95-100	85-95	50-80	35-65	15-30	2-12
	19-60	Fine sandy loam, loam, sandy loam.	SM, SC, ML, CL	A-4, A-6	0-1	0-3	95-100	85-95	50-80	35-65	15-30	2-12

Engineering Index Properties--Continued

Map symbol and soil 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	
778B:												
Dorset----------	0-10	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	10-20	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	20-38	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	38-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
Corliss---------	0-7	Loamy coarse sand.	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	7-16	Loamy sand, gravelly sand, coarse sand.	SP-SM, SM, SP	A-1-b, A-2-4, A-3	0	0-5	75-95	50-85	35-70	2-25	15-21	NP-4
	16-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP
778C:												
Dorset----------	0-9	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	9-16	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	16-43	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	43-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
Corliss---------	0-7	Loamy coarse sand.	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	7-11	Loamy sand, gravelly sand, coarse sand.	SP-SM, SM, SP	A-1-b, A-2-4, A-3	0	0-5	75-95	50-85	35-70	2-25	15-21	NP-4
	11-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
779B:												
Peever	0-11	Clay loam	CL	A-6, A-7	0	0	100	95-100	90-100	65-90	35-50	12-25
	11-29	Clay, silty clay, clay loam.	CL, CH, MH, ML	A-7	0	0	100	95-100	85-100	70-85	40-65	15-30
	29-60	Clay loam, clay	CL, CH, MH, ML	A-7	0	0-5	95-100	90-100	85-100	70-85	40-65	15-30
Mehurin	0-13	Clay loam	CL	A-6, A-7	0	0-4	95-100	90-98	50-90	50-80	35-40	15-20
	13-35	Clay loam, silty clay, clay.	CL, CH, MH	A-7	0	0-4	95-100	90-98	50-90	50-90	45-65	20-40
	35-48	Clay loam, loam	CL	A-6, A-7	0	0-4	95-100	90-98	45-90	45-80	30-45	10-20
	48-60	Clay loam, loam	CL	A-6, A-7	0	0-4	95-100	90-98	45-90	45-80	30-45	10-20
902B:												
Barnes	0-9	Loam	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	80-100	50-90	20-40	5-20
	9-17	Loam, sandy clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6	0	0-5	90-100	85-100	75-95	35-80	25-40	5-20
	17-60	Loam	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-40	5-20
Buse	0-8	Loam	ML, CL, CL-ML	A-4, A-6	0	0	90-100	85-95	70-90	55-80	20-40	3-15
	8-40	Loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-95	70-90	60-80	25-40	5-15
	40-60	Loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-95	70-90	60-80	25-40	5-15
903C2:												
Barnes	0-10	Loam	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	80-100	50-90	20-40	5-20
	10-16	Loam, sandy clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6	0	0-5	90-100	85-100	75-95	35-80	25-40	5-20
	16-60	Loam	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-40	5-20
Langhei	0-7	Loam	CL-ML, CL	A-4, A-6	0	0-3	95-100	90-100	75-90	55-80	20-40	5-20
	7-30	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0-3	95-100	90-100	75-90	60-80	20-40	5-25
	30-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0-3	95-100	90-100	75-90	60-80	20-40	5-25
915C2:												
Forman	0-8	Clay loam	CL	A-6, A-7	0	0-5	95-100	90-100	85-100	70-80	30-45	10-25
	8-23	Clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	23-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
Buse	0-7	Loam	ML, CL, CL-ML	A-4, A-6	0	0	90-100	85-95	70-90	55-80	20-40	3-15
	7-30	Loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-95	70-90	60-80	25-40	5-15
	30-60	Loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-95	70-90	60-80	25-40	5-15

Engineering Index Properties--Continued

Map symbol and soil 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	
915D2:												
Forman----------	0-9	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	85-100	70-80	30-45	10-25
	9-23	Clay loam------	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
	23-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-80	25-45	5-20
Buse----------	0-9	Loam----------	ML, CL, CL-ML	A-4, A-6	0	0	90-100	85-95	70-90	55-80	20-40	3-15
	9-16	Loam----------	CL, CL-ML	A-4, A-6	0	0	90-100	85-95	70-90	60-80	25-40	5-15
	16-60	Loam----------	CL, CL-ML	A-4, A-6	0	0	90-100	85-95	70-90	60-80	25-40	5-15
931C2:												
Formdale--------	0-8	Clay loam------	CL	A-7, A-6	0	0-3	95-100	90-100	85-100	75-90	35-50	15-30
	8-18	Clay loam, loam	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	18-39	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	39-60	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
Langhei---------	0-7	Clay loam------	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
	7-16	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
	16-60	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
931D2:												
Formdale--------	0-8	Clay loam------	CL	A-7, A-6	0	0-3	95-100	90-100	85-100	75-90	35-50	15-30
	8-12	Clay loam, loam	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	12-26	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	26-60	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
Langhei---------	0-5	Clay loam------	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
	5-21	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20
	21-60	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	0	95-100	90-100	75-95	70-80	35-45	10-20

Engineering Index Properties--Continued

Map symbol and soil 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	
942D2:												
Langhei---------	0-7	Loam----------	CL-ML, CL	A-4, A-6	0	0-3	95-100	90-100	75-90	55-80	20-40	5-20
	7-13	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0-3	95-100	90-100	75-90	60-80	20-40	5-25
	13-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0-3	95-100	90-100	75-90	60-80	20-40	5-25
Barnes----------	0-7	Loam----------	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	80-100	50-90	20-40	5-20
	7-14	Loam, sandy clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6	0	0-5	90-100	85-100	75-95	35-80	25-40	5-20
	14-60	Loam----------	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-95	55-80	25-40	5-20
957B2:												
Rothsay---------	0-15	Silt loam------	ML	A-4	0	0	95-100	95-100	90-100	85-100	20-40	NP-10
	15-27	Silt loam, very fine sandy loam, loam.	ML	A-4	0	0	95-100	95-100	90-100	80-100	20-40	NP-10
	27-33	Silt loam, loam, very fine sandy loam.	ML	A-4	0	0	95-100	95-100	90-100	80-90	10-28	NP-10
	33-60	Silt loam, loam, very fine sandy loam.	ML	A-4	0	0	95-100	95-100	90-100	80-90	10-28	NP-10
Zell----------	0-9	Silt loam------	CL, ML	A-4, A-6	0	0	100	95-100	90-100	80-100	30-40	5-15
	9-18	Silt loam, very fine sandy loam, loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	85-100	70-100	25-40	5-15
	18-60	Silt loam, very fine sandy loam, loam.	ML, CL-ML	A-4	0	0	100	95-100	85-100	60-100	15-25	NP-7
969C2:												
Zell----------	0-8	Silt loam------	CL, ML	A-4, A-6	0	0	100	95-100	90-100	80-100	30-40	5-15
	8-31	Silt loam, very fine sandy loam, loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	85-100	70-100	25-40	5-15
	31-60	Silt loam, very fine sandy loam, loam.	ML, CL-ML	A-4	0	0	100	95-100	85-100	60-100	15-25	NP-7

Engineering Index Properties--Continued

Map symbol and soil 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	
969C2:												
Rothsay---------	0-9	Silt loam------	ML	A-4	0	0	95-100	95-100	90-100	85-100	20-40	NP-10
	9-17	Silt loam, very fine sandy loam, loam.	ML	A-4	0	0	95-100	95-100	90-100	80-100	20-40	NP-10
	17-28	Silt loam, loam, very fine sandy loam.	ML	A-4	0	0	95-100	95-100	90-100	80-90	10-28	NP-10
	28-60	Silt loam, loam, very fine sandy loam.	ML	A-4	0	0	95-100	95-100	90-100	80-90	10-28	NP-10
969D2:												
Zell----------	0-8	Silt loam------	CL, ML	A-4, A-6	0	0	100	95-100	90-100	80-100	30-40	5-15
	8-13	Silt loam, very fine sandy loam, loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	85-100	70-100	25-40	5-15
	13-60	Silt loam, very fine sandy loam, loam.	ML, CL-ML	A-4	0	0	100	95-100	85-100	60-100	15-25	NP-7
Rothsay---------	0-6	Silt loam------	ML	A-4	0	0	95-100	95-100	90-100	85-100	20-40	NP-10
	6-12	Silt loam, very fine sandy loam, loam.	ML	A-4	0	0	95-100	95-100	90-100	80-100	20-40	NP-10
	12-32	Silt loam, loam, very fine sandy loam.	ML	A-4	0	0	95-100	95-100	90-100	80-90	10-28	NP-10
	32-60	Silt loam, loam, very fine sandy loam.	ML	A-4	0	0	95-100	95-100	90-100	80-90	10-28	NP-10
1015:												
Udipsamments----	0-14	Sand----------	SM, SP-SM	A-2	0	0	95-100	85-100	75-90	10-35	---	NP
	14-60	Sand, fine sand	SP-SM, SP	A-2, A-3	0	0	95-100	85-100	50-75	5-25	---	NP
	60-80	Coarse sand, gravelly coarse sand.	SP, SP-SM, GP-GM	A-1, A-2	0	0	75-100	65-85	40-65	1-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1016:												
Udorthents------	0-60	Variable-------	---	---	---	---	---	---	---	---	---	---
	60-80	Variable-------	---	---	0	0	0	0	0	0	---	NP
1027:												
Udorthents.												
1030:												
Pits.												
Udipsamments----	0-14	Sand----------	SM, SP-SM	A-2	0	0	95-100	85-100	75-90	10-35	---	NP
	14-60	Sand, fine sand	SP-SM, SP	A-2, A-3	0	0	95-100	85-100	50-75	5-25	---	NP
	60-80	Coarse sand, gravelly coarse sand.	SP, SP-SM, GP-GM	A-1, A-2	0	0	75-100	65-85	40-65	1-10	---	NP
1077:												
Forada----------	0-16	Loam----------	ML	A-4	0	0	95-100	85-100	70-90	50-70	25-35	NP-10
	16-27	Sandy loam, loam, fine sandy loam.	ML, SM	A-4, A-2	0	0	95-100	85-100	55-85	30-60	20-40	NP-10
	27-60	Sand, coarse sand, gravelly coarse sand.	SP, SM, SP-SM, GP-GM	A-1, A-2, A-3	0	0	50-90	50-80	40-70	2-30	---	NP
Leafriver-------	0-12	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	12-20	Loamy sand, sandy loam, fine sand.	SM	A-4, A-2-4	0	0	100	95-100	55-80	15-40	15-20	NP-4
	20-60	Loamy sand, fine sand, sand.	SM, SP-SM, SP	A-3, A-2, A-2-4, A-1-b	0	0	95-100	80-100	45-70	3-35	---	NP
1102B:												
Chapett---------	0-10	Loam----------	ML, CL, CL-ML	A-4, A-6	0-1	0-5	95-100	85-95	55-85	50-70	15-30	3-15
	10-25	Sandy clay loam, sandy loam, loam.	ML, CL	A-4, A-6	0-1	0-5	95-100	85-95	55-85	55-70	20-40	8-20
	25-37	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
	37-60	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12

Engineering Index Properties--Continued

Map symbol and soil 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	
1102B:												
Dorset----------	0-12	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	12-15	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	15-32	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	32-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
1102C:												
Chapett---------	0-9	Loam----------	ML, CL, CL-ML	A-4, A-6	0-1	0-5	95-100	85-95	55-85	50-70	15-30	3-15
	9-20	Sandy clay loam, sandy loam, loam.	ML, CL	A-4, A-6	0-1	0-5	95-100	85-95	55-85	55-70	20-40	8-20
	20-34	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
	34-60	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
Dorset----------	0-10	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	10-18	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	18-29	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	29-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1103:												
Clitherall------	0-10	Sandy loam-----	SM, SC-SM	A-2-4, A-4	0	0	95-100	85-98	50-85	15-70	15-20	3-9
	10-16	Coarse sandy loam, sandy loam, loam.	SC, SC-SM, CL-ML	A-4, A-2-4, A-1-b	0	0	95-100	85-100	50-85	15-70	15-30	4-14
	16-38	Gravelly loamy sand, gravelly sand, gravelly coarse sand.	SP-SM, SM, GP-GM	A-1-a, A-1-b, A-3	0	0-1	50-95	50-90	5-65	2-30	0-20	NP
	38-80	Fine sandy loam, sandy loam, loam.	SC, SC-SM, CL-ML	A-4, A-2-4	0	0-5	85-98	85-98	65-80	35-50	23-28	4-9
1104B:												
Waukon----------	0-9	Loam----------	ML, CL, CL-ML	A-6, A-4	0-1	0-3	95-100	90-100	80-95	60-90	20-40	5-20
	9-34	Clay loam, loam	CL, ML	A-6, A-7	0-1	0-3	95-100	90-100	75-95	50-85	30-45	10-20
	34-60	Loam, clay loam	ML, CL	A-6	0-1	0-3	95-100	90-100	70-95	50-80	30-40	10-20
Dorset----------	0-9	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	9-23	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	23-33	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	33-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
1104C:												
Waukon----------	0-9	Loam----------	ML, CL, CL-ML	A-6, A-4	0-1	0-3	95-100	90-100	80-95	60-90	20-40	5-20
	9-28	Clay loam, loam	CL, ML	A-6, A-7	0-1	0-3	95-100	90-100	75-95	50-85	30-45	10-20
	28-60	Loam, clay loam	ML, CL	A-6	0-1	0-3	95-100	90-100	70-95	50-80	30-40	10-20

Engineering Index Properties--Continued

Map symbol and soil 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	
1104C:												
Dorset----------	0-10	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	10-14	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	14-20	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	20-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
1104D:												
Waukon----------	0-9	Loam----------	ML, CL, CL-ML	A-6, A-4	0-1	0-3	95-100	90-100	80-95	60-90	20-40	5-20
	9-21	Clay loam, loam	CL, ML	A-6, A-7	0-1	0-3	95-100	90-100	75-95	50-85	30-45	10-20
	21-60	Loam, clay loam	ML, CL	A-6	0-1	0-3	95-100	90-100	70-95	50-80	30-40	10-20
Dorset----------	0-8	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	8-18	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	18-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
1105B:												
Dent----------	0-12	Silt loam------	CL-ML, CL, ML	A-4, A-6	0	0	100	95-100	85-100	60-90	15-34	3-13
	12-26	Silt loam, silty clay loam, loam.	CL, CL-ML, ML	A-4, A-6, A-7, A-5	0	0	100	95-100	80-100	75-95	30-50	10-25
	26-54	Silt loam, loam, very fine sandy loam.	CL, CL-ML, ML	A-4, A-6	0	0	100	95-100	85-100	60-95	20-40	3-17
	54-80	Very fine sandy loam, silt loam, loamy very fine sand.	CL-ML, ML, SM, SC-SM	A-2-4, A-4	0	0	100	95-100	65-100	15-90	15-32	NP-12

Engineering Index Properties--Continued

Map symbol and soil 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	
1110:												
Isan----------	0-16	Sandy loam-----	SC-SM, SM	A-2	0	0	95-100	92-100	50-75	15-35	15-20	2-5
	16-26	Sand, loamy sand.	SM, SP-SM	A-2	0	0	95-100	92-100	50-75	10-30	15-20	NP
	26-60	Sand, coarse sand.	SM, SP	A-1, A-2, A-3	0	0	85-100	85-100	35-70	2-15	15-20	NP
1111:												
Nidaros---------	0-32	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	32-38	Sandy clay loam, sandy loam, loam.	SC, CL, CL-ML, SC-SM	A-6, A-2-6, A-4	0	0	95-100	85-100	50-95	30-75	21-40	NP-20
	38-60	Coarse sand, loamy sand, gravelly sand.	SP, SM, SP-SM, SW	A-1-b, A-3, A-2-4	0	0	60-100	50-100	30-70	3-30	---	NP
1112D:												
Chapett---------	0-8	Loam----------	ML, CL, CL-ML	A-4, A-6	0-1	0-5	95-100	85-95	55-85	50-70	15-30	3-15
	8-18	Sandy clay loam, sandy loam, loam.	ML, CL	A-4, A-6	0-1	0-5	95-100	85-95	55-85	55-70	20-40	8-20
	18-30	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
	30-60	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
Corliss---------	0-6	Loamy sand-----	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	6-18	Loamy sand, gravelly sand, coarse sand.	SP-SM, SM, SP	A-1-b, A-2-4, A-3	0	0-5	75-95	50-85	35-70	2-25	15-21	NP-4
	18-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1112E:												
Chapett---------	0-7	Loam----------	ML, CL, CL-ML	A-4, A-6	0-1	0-5	95-100	85-95	55-85	50-70	15-30	3-15
	7-20	Sandy clay loam, sandy loam, loam.	ML, CL	A-4, A-6	0-1	0-5	95-100	85-95	55-85	55-70	20-40	8-20
	20-37	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
	37-60	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
Corliss---------	0-7	Loamy sand-----	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	7-10	Loamy sand, gravelly sand, coarse sand.	SP-SM, SM, SP	A-1-b, A-2-4, A-3	0	0-5	75-95	50-85	35-70	2-25	15-21	NP-4
	10-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP
1113:												
Haslie----------	0-44	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	44-60	Coprogenous earth, mucky silty clay.	OL	A-5	0	0	100	95-100	85-100	75-96	41-50	2-10
Seelyeville-----	0-30	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	30-60	Mucky peat, muck.	PT	A-8	0	0	0	0	0	0	---	NP
Cathro----------	0-30	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	30-60	Sandy loam, silt loam, clay loam.	SC-SM, CL-ML, SC, CL	A-4, A-6	0	0-5	80-100	65-100	60-100	35-90	20-40	4-20
1114:												
Hangaard--------	0-8	Loamy sand-----	SP-SM, SM	A-3, A-1, A-2	0	0-3	95-100	80-100	50-75	10-20	---	NP
	8-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP-SM, SP	A-3, A-1, A-2	0	2-5	70-95	55-90	30-60	0-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1120:												
Rushlake--------	0-5	Loamy sand-----	SM, SP-SM	A-1-b, A-2-4	0	0	95-100	75-100	15-60	10-35	---	NP
	5-60	Gravelly sand, gravelly loamy sand, sand.	SP, SP-SM	A-1-b, A-3	0	0-3	55-95	50-90	15-60	2-10	---	NP
Hangaard--------	0-4	Loamy sand-----	SP-SM, SM	A-3, A-1, A-2	0	0-3	95-100	80-100	50-75	10-20	---	NP
	4-60	Gravelly coarse sand, gravelly sand, coarse sand.	SP-SM, SP	A-3, A-1, A-2	0	2-5	70-95	55-90	30-60	0-10	---	NP
1129:												
Lindaas---------	0-15	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-95	41-48	21-25
	15-25	Clay, silty clay.	CL, CH	A-7	0	0	100	100	95-100	85-95	51-76	29-49
	25-60	Silt loam, silty clay loam.	CL-ML	A-6	0	0	100	100	95-100	85-95	41-48	21-25
1131B:												
Verndale--------	0-9	Sandy loam-----	SM, SC-SM	A-4, A-2-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	9-19	Sandy loam, fine sandy loam, loam.	SC, SC-SM	A-4, A-2-4	0	0	98-100	85-100	60-85	25-45	20-26	5-10
	19-49	Sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP-2
	49-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1-b, A-2-4	0	0	96-100	75-100	45-60	3-10	---	NP
Abbeylake-------	0-8	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	85-100	55-70	10-25	---	NP-4
	8-19	Sand, coarse sand, loamy sand.	SP, SP-SM, SM	A-3, A-2-4	0	0	100	85-100	55-75	2-15	---	NP-4
	19-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1	0	0	100	85-100	40-75	2-10	---	NP
1136:												
Nidaros---------	0-27	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	27-38	Sandy clay loam, sandy loam, loam.	SC, CL, CL-ML, SC-SM	A-6, A-2-6, A-4	0	0	95-100	85-100	50-95	30-75	21-40	NP-20
	38-60	Coarse sand, loamy sand, gravelly sand.	SP, SM, SP-SM, SW	A-1-b, A-3, A-2-4	0	0	60-100	50-100	30-70	3-30	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1149:												
Hamerly---------	0-16	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	80-95	75-95	35-45	15-25
	16-25	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-75	25-45	10-25
	25-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	75-95	55-75	25-45	10-25
1195A:												
Sybil----------	0-6	Loamy sand-----	SM, SP-SM	A-1-b, A-2-4, A-4	0	0	95-100	90-100	35-100	5-45	15-20	NP-4
	6-14	Loamy sand, loamy fine sand, sandy loam.	SM, SP-SM, SC-SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	35-90	10-55	15-25	NP-7
	14-19	Sandy loam, fine sandy loam.	SM, SC-SM, SC	A-4, A-2-4	0	0	95-100	90-100	50-90	15-70	20-30	3-9
	19-34	Sand, loamy coarse sand, loamy sand.	SP-SM, SM	A-1-b, A-2-4, A-3	0	0	90-100	85-100	35-100	5-45	15-20	NP-4
	34-80	Sand, coarse sand.	SP, SP-SM	A-1-b, A-3	0	0	90-100	85-100	35-80	2-10	---	NP
Eagleview-------	0-8	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	8-32	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	32-60	Sand, coarse sand, loamy sand.	SP, SP-SM, SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	60-80	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1195B:												
Sybil----------	0-5	Loamy sand-----	SM, SP-SM	A-1-b, A-2-4, A-4	0	0	95-100	90-100	35-100	5-45	15-20	NP-4
	5-10	Loamy sand, loamy fine sand, sandy loam.	SM, SP-SM, SC-SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	35-90	10-55	15-25	NP-7
	10-15	Sandy loam, fine sandy loam.	SM, SC-SM, SC	A-4, A-2-4	0	0	95-100	90-100	50-90	15-70	20-30	3-9
	15-32	Sand, loamy coarse sand, loamy sand.	SP-SM, SM	A-1-b, A-2-4, A-3	0	0	90-100	85-100	35-100	5-45	15-20	NP-4
	32-80	Sand, coarse sand.	SP, SP-SM	A-1-b, A-3	0	0	90-100	85-100	35-80	2-10	---	NP
Eagleview-------	0-4	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	4-36	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	36-60	Sand, coarse sand, loamy sand.	SP, SP-SM, SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
1195C:												
Sybil----------	0-8	Loamy sand-----	SM, SP-SM	A-1-b, A-2-4, A-4	0	0	95-100	90-100	35-100	5-45	15-20	NP-4
	8-17	Loamy sand, loamy fine sand, sandy loam.	SM, SP-SM, SC-SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	35-90	10-55	15-25	NP-7
	17-26	Sandy loam, fine sandy loam.	SM, SC-SM, SC	A-4, A-2-4	0	0	95-100	90-100	50-90	15-70	20-30	3-9
	26-37	Sand, loamy coarse sand, loamy sand.	SP-SM, SM	A-1-b, A-2-4, A-3	0	0	90-100	85-100	35-100	5-45	15-20	NP-4
	37-80	Sand, coarse sand.	SP, SP-SM	A-1-b, A-3	0	0	90-100	85-100	35-80	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1195C:												
Eagleview-------	0-3	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	3-37	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	37-60	Sand, coarse sand, loamy sand.	SP, SP-SM, SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	60-80	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP
1195E:												
Sybil----------	0-4	Sandy loam-----	SM, SC-SM, SC	A-2-4, A-4	0	0	95-100	90-100	50-90	15-55	15-30	NP-9
	4-15	Loamy sand, loamy fine sand, sandy loam.	SM, SP-SM, SC-SM	A-1-b, A-2-4, A-3	0	0	95-100	90-100	35-90	10-55	15-25	NP-7
	15-25	Sandy loam, fine sandy loam.	SM, SC-SM, SC	A-4, A-2-4	0	0	95-100	90-100	50-90	15-70	20-30	3-9
	25-78	Sand, loamy coarse sand, loamy sand.	SP-SM, SM	A-1-b, A-2-4, A-3	0	0	90-100	85-100	35-100	5-45	15-20	NP-4
	78-80	Sand, coarse sand.	SP, SP-SM	A-1-b, A-3	0	0	90-100	85-100	35-80	2-10	---	NP
Eagleview-------	0-7	Loamy sand-----	SP-SM, SM	A-2, A-1	0	0	100	85-100	60-80	10-25	---	NP
	7-17	Loamy sand, loamy coarse sand, sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	17-55	Sand, coarse sand, loamy sand.	SP, SP-SM, SM	A-3, A-2, A-1	0	0	100	85-100	50-75	2-15	---	NP
	55-80	Sand, coarse sand.	SP, SP-SM	A-3, A-2, A-1	0	0	100	85-100	40-75	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1196B:												
Lida----------	0-9	Sandy loam-----	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	9-13	Loamy sand, loamy coarse sand, sandy loam.	SM, SP-SM	A-4, A-3, A-2-4	0	0-10	85-100	85-100	30-85	10-55	0-25	NP-7
	13-25	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	25-45	Loamy sand, gravelly loamy coarse sand, gravelly loamy sand.	GM, GP-GM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-5	50-85	50-85	20-65	5-25	---	NP
	45-60	Gravelly coarse sand, sand, gravelly sand.	GP, GW, GP-GM, SP	A-3, A-1-b, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP
Two Inlets------	0-7	Sandy loam-----	SM	A-2, A-2-4	0	0-2	80-100	50-90	40-65	20-35	15-21	NP-4
	7-14	Loamy coarse sand, gravelly loamy coarse sand, coarse sandy loam.	SM	A-2-4	0	0-2	80-100	50-90	30-65	15-30	15-21	NP-4
	14-29	Loamy coarse sand, gravelly loamy coarse sand, loamy sand.	SM	A-2-4, A-2, A-3	0	0-5	80-100	50-90	30-65	5-30	15-25	NP-7
	29-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM	A-1, A-3	0	0-5	60-95	50-75	30-55	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1196C:												
Lida----------	0-8	Sandy loam-----	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	8-17	Loamy sand, loamy coarse sand, sandy loam.	SM, SP-SM	A-4, A-3, A-2-4	0	0-10	85-100	85-100	30-85	10-55	0-25	NP-7
	17-25	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	25-41	Loamy sand, gravelly loamy coarse sand, gravelly loamy sand.	GM, GP-GM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-5	50-85	50-85	20-65	5-25	---	NP
	41-80	Gravelly coarse sand, sand, gravelly sand	GP, GW, GP-GM, SP	A-3, A-1-b, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP
Two Inlets------	0-4	Sandy loam-----	SM	A-2, A-2-4	0	0-2	80-100	50-90	40-65	20-35	15-21	NP-4
	4-9	Loamy coarse sand, gravelly loamy coarse sand, coarse sandy loam.	SM	A-2-4	0	0-2	80-100	50-90	30-65	15-30	15-21	NP-4
	9-38	Loamy coarse sand, gravelly loamy coarse sand, loamy sand.	SM	A-2-4, A-2, A-3	0	0-5	80-100	50-90	30-65	5-30	15-25	NP-7
	38-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM	A-1, A-3	0	0-5	60-95	50-75	30-55	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1196E:												
Lida	0-3	Sandy loam	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	3-14	Loamy sand, loamy coarse sand, sandy loam.	SM, SP-SM	A-4, A-3, A-2-4	0	0-10	85-100	85-100	30-85	10-55	0-25	NP-7
	14-20	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	20-27	Loamy sand, gravelly loamy coarse sand, gravelly loamy sand.	GM, GP-GM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-5	50-85	50-85	20-65	5-25	---	NP
	27-60	Gravelly coarse sand, sand, gravelly sand.	GP, GW, GP-GM, SP	A-3, A-1-b, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP
Two Inlets	0-3	Sandy loam	SM	A-2, A-2-4	0	0-2	80-100	50-90	40-65	20-35	15-21	NP-4
	3-7	Loamy coarse sand, gravelly loamy coarse sand, coarse sandy loam.	SM	A-2-4	0	0-2	80-100	50-90	30-65	15-30	15-21	NP-4
	7-21	Loamy coarse sand, gravelly loamy coarse sand, loamy sand.	SM	A-2-4, A-2, A-3	0	0-5	80-100	50-90	30-65	5-30	15-25	NP-7
	21-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM	A-1, A-3	0	0-5	60-95	50-75	30-55	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1196F:												
Lida----------	0-4	Sandy loam-----	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	4-17	Loamy sand, loamy coarse sand, sandy loam.	SM, SP-SM	A-4, A-3, A-2-4	0	0-10	85-100	85-100	30-85	10-55	0-25	NP-7
	17-25	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	25-28	Loamy sand, gravelly loamy coarse sand, gravelly loamy sand.	GM, GP-GM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-5	50-85	50-85	20-65	5-25	---	NP
	28-60	Gravelly coarse sand, sand, gravelly sand.	GP, GW, GP-GM, SP	A-3, A-1-b, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP
Two Inlets------	0-3	Sandy loam-----	SM	A-2, A-2-4	0	0-2	80-100	50-90	40-65	20-35	15-21	NP-4
	3-7	Loamy coarse sand, gravelly loamy coarse sand, coarse sandy loam.	SM	A-2-4	0	0-2	80-100	50-90	30-65	15-30	15-21	NP-4
	7-14	Loamy coarse sand, gravelly loamy coarse sand, loamy sand.	SM	A-2-4, A-2, A-3	0	0-5	80-100	50-90	30-65	5-30	15-25	NP-7
	14-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM	A-1, A-3	0	0-5	60-95	50-75	30-55	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1200:												
Egglake---------	0-4	Loam----------	ML, CL-ML	A-4	0-1	0-5	95-100	85-98	50-97	50-90	15-25	3-7
	4-9	Fine sandy loam, sandy loam, loam.	SM	A-2-4	0-1	0-5	95-100	85-98	40-50	25-35	15-21	2-4
	9-25	Sandy clay loam, sandy loam, loam.	SC, CL	A-6, A-4	0-1	0-5	95-100	85-98	55-75	40-60	28-36	9-15
	25-60	Sandy loam, coarse sandy loam, fine sandy loam.	SC-SM, SC, CL-ML, CL	A-4	0-1	0-5	95-100	85-98	50-70	35-55	21-28	4-9
1208B:												
Naytahwaush-----	0-7	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	75-90	60-90	35-50	15-25
	7-25	Clay, silty clay, clay loam.	CL, CH	A-7	0	0-5	95-100	90-100	75-95	70-90	45-65	25-40
	25-60	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	0-5	95-100	90-100	75-95	60-90	35-50	15-25
Mahkonce--------	0-7	Clay loam------	CL, ML	A-6, A-7	0	0-5	95-100	90-98	75-95	60-90	35-50	15-25
	7-37	Silty clay, clay.	CH	A-7	0	0-5	95-100	90-98	75-95	70-90	50-65	25-40
	37-55	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	0-5	95-100	95-98	75-95	60-90	35-50	15-25
	55-60	Loam, clay loam, silty clay loam.	CL	A-6, A-7	0-1	0-5	95-100	90-98	75-95	60-90	35-50	15-25
1209C:												
Naytahwaush-----	0-7	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	75-90	60-90	35-50	15-25
	7-24	Clay, silty clay, clay loam.	CL, CH	A-7	0	0-5	95-100	90-100	75-95	70-90	45-65	25-40
	24-60	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	0-5	95-100	90-100	75-95	60-90	35-50	15-25

Engineering Index Properties--Continued

Map symbol and soil 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	
1212B:												
Mahkonce--------	0-7	Clay loam------	CL, ML	A-6, A-7	0	0-5	95-100	90-98	75-95	60-90	35-50	15-25
	7-23	Silty clay, clay.	CH	A-7	0	0-5	95-100	90-98	75-95	70-90	50-65	25-40
	23-46	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	0-5	95-100	95-98	75-95	60-90	35-50	15-25
	46-60	Loam, clay loam, silty clay loam.	CL	A-6, A-7	0-1	0-5	95-100	90-98	75-95	60-90	35-50	15-25
1214:												
Mustinka--------	0-14	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	70-95	40-52	20-30
	14-24	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	100	100	90-100	75-95	47-72	25-44
	24-36	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0	0	100	95-100	85-100	70-95	31-47	12-25
	36-80	Clay loam, silty clay loam, loam.	CL, CH	A-4, A-5, A-6, A-7	0	0	95-100	85-98	75-95	50-90	31-47	12-25
1215:												
Pinelake--------	0-12	Sandy loam-----	SM, SC-SM, ML, CL-ML	A-4, A-2-4, A-1-b	0	0	95-100	75-100	50-85	15-70	15-25	3-7
	12-30	Coarse sandy loam, sandy loam, loam.	CL, SC-SM, SC, CL-ML	A-4, A-2-4, A-1-b	0	0	95-100	75-100	20-75	15-70	23-30	5-9
	30-35	Loamy sand, loamy coarse sand, gravelly sand.	SM, SP-SM, GP-GM	A-2-4, A-4, A-1-b	0	0	50-98	50-98	10-65	10-45	0-20	NP-2
	35-80	Sand, coarse sand, gravelly coarse sand.	SP, SM, SP-SM, GP-GM	A-1-b, A-2-4, A-3	0	0-2	50-98	50-98	40-70	2-20	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1216B:												
Egglake---------	0-4	Fine sandy loam	SM, SC-SM	A-4, A-2-4	0-1	0-5	95-100	85-98	45-55	30-40	15-25	3-7
	4-8	Fine sandy loam, sandy loam, loam.	SM	A-2-4	0-1	0-5	95-100	85-98	40-50	25-35	15-21	2-4
	8-22	Sandy clay loam, sandy loam, loam.	SC, CL	A-6, A-4	0-1	0-5	95-100	85-98	55-75	40-60	28-36	9-15
	22-60	Sandy loam, coarse sandy loam, fine sandy loam.	SC-SM, SC, CL-ML, CL	A-4	0-1	0-5	95-100	85-98	50-70	35-55	21-28	4-9
Wykeham---------	0-9	Fine sandy loam	SM, SC-SM	A-4	0	0-5	90-100	85-100	65-80	40-50	25-30	2-5
	9-13	Fine sandy loam, loamy sand, sandy loam.	SM, SC-SM	A-4, A-2	0	0-5	85-100	70-95	65-80	25-50	15-20	1-5
	13-40	Loam, sandy clay loam, sandy loam.	SC, CL	A-6	0	0-5	90-100	85-95	70-80	35-60	30-35	10-15
	40-60	Fine sandy loam, sandy loam.	SC-SM, SC	A-4	0	0-5	85-95	85-95	65-80	35-50	20-25	5-10
1217E:												
Waukon----------	0-8	Loam----------	ML, CL, CL-ML	A-6, A-4	0-1	0-3	95-100	90-100	80-95	60-90	20-40	5-20
	8-36	Clay loam, loam	CL, ML	A-6, A-7	0-1	0-3	95-100	90-100	75-95	50-85	30-45	10-20
	36-60	Loam, clay loam	ML, CL	A-6	0-1	0-3	95-100	90-100	70-95	50-80	30-40	10-20
Lida----------	0-6	Sandy loam-----	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	6-16	Loamy sand, loamy coarse sand, sandy loam.	SM, SP-SM	A-4, A-3, A-2-4	0	0-10	85-100	85-100	30-85	10-55	0-25	NP-7
	16-36	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	36-60	Gravelly coarse sand, sand, gravelly sand.	GP, GW, GP-GM, SP	A-3, A-1-b, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1218B:												
Snellman--------	0-3	Fine sandy loam	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	3-10	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	10-42	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	42-55	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
	55-80	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
Lida----------	0-5	Sandy loam-----	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	5-19	Loamy sand, loamy coarse sand, sandy loam.	SM, SP-SM	A-4, A-3, A-2-4	0	0-10	85-100	85-100	30-85	10-55	0-25	NP-7
	19-31	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	31-35	Loamy sand, gravelly loamy coarse sand, gravelly loamy sand.	GM, GP-GM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-5	50-85	50-85	20-65	5-25	---	NP
	35-80	Gravelly coarse sand, sand, gravelly sand.	GP, GW, GP-GM, SP	A-3, A-1-b, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1218C:												
Snellman--------	0-3	Fine sandy loam	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	3-10	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	10-39	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	39-80	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
Lida----------	0-6	Sandy loam-----	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	6-13	Loamy sand, loamy coarse sand, sandy loam.	SM, SP-SM	A-4, A-3, A-2-4	0	0-10	85-100	85-100	30-85	10-55	0-25	NP-7
	13-20	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	20-80	Gravelly coarse sand, sand, gravelly sand.	GP, GW, GP-GM, SP	A-3, A-1-b, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP
1218E:												
Snellman--------	0-3	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	3-8	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	8-30	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	30-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10

Engineering Index Properties--Continued

Map symbol and soil 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	
1218E:												
Lida----------	0-6	Sandy loam-----	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	6-13	Loamy sand, loamy coarse sand, sandy loam.	SM, SP-SM	A-4, A-3, A-2-4	0	0-10	85-100	85-100	30-85	10-55	0-25	NP-7
	13-28	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	28-42	Loamy sand, gravelly loamy coarse sand, gravelly loamy sand.	GM, GP-GM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-5	50-85	50-85	20-65	5-25	---	NP
	42-60	Gravelly coarse sand, sand, gravelly sand.	GP, GW, GP-GM, SP	A-3, A-1-b, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP
1218F:												
Snellman--------	0-3	Sandy loam-----	SM, SC-SM	A-4	0	0-10	90-100	80-95	65-80	40-50	25-30	2-5
	3-13	Loamy sand, sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2	0	0-10	88-100	80-95	65-80	30-50	15-20	NP-5
	13-23	Sandy clay loam, sandy loam, clay loam.	SC, CL	A-6	0	0-10	90-100	80-95	70-80	35-50	25-40	10-20
	23-40	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10
	40-60	Sandy loam, fine sandy loam.	SC-SM, SC	A-4	0	0-10	85-95	80-95	65-80	35-50	15-25	5-10

Engineering Index Properties--Continued

Map symbol and soil 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	
1218F:												
Lida----------	0-4	Sandy loam-----	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	4-14	Loamy sand, loamy coarse sand, sandy loam.	SM, SP-SM	A-4, A-3, A-2-4	0	0-10	85-100	85-100	30-85	10-55	0-25	NP-7
	14-24	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	24-35	Loamy sand, gravelly loamy coarse sand, gravelly loamy sand.	GM, GP-GM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-5	50-85	50-85	20-65	5-25	---	NP
	35-60	Gravelly coarse sand, sand, gravelly sand.	GP, GW, GP-GM, SP	A-3, A-1-b, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP
1219C:												
Sandberg--------	0-8	Sandy loam-----	SM	A-2	0-3	0-5	85-100	50-95	50-65	25-35	15-20	NP-7
	8-25	Gravelly loamy coarse sand, gravelly coarse sand, loamy sand.	SP-SM, SM	A-1, A-2, A-3	0-3	0-5	75-95	50-95	35-70	5-25	---	NP-4
	25-36	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
	36-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
Sverdrup--------	0-12	Sandy loam-----	SM	A-4	0	0	100	95-100	60-70	35-50	---	NP
	12-24	Loam, sandy loam, loamy sand.	ML, SM	A-2, A-4	0	0	100	95-100	50-75	30-70	15-30	NP-5
	24-60	Sand, fine sand	SP, SP-SM	A-3, A-2	0	0	100	95-100	50-90	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1221B:												
Sverdrup--------	0-15	Sandy loam-----	SM	A-4	0	0	100	95-100	60-70	35-50	---	NP
	15-28	Loam, sandy loam, loamy sand.	ML, SM	A-2, A-4	0	0	100	95-100	50-75	30-70	15-30	NP-5
	28-60	Sand, fine sand	SP, SP-SM	A-3, A-2	0	0	100	95-100	50-90	2-10	---	NP
Sandberg--------	0-8	Sandy loam-----	SM	A-2	0-3	0-5	85-100	50-95	50-65	25-35	15-20	NP-7
	8-14	Gravelly loamy coarse sand, gravelly coarse sand, loamy sand.	SP-SM, SM	A-1, A-2, A-3	0-3	0-5	75-95	50-95	35-70	5-25	---	NP-4
	14-24	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
	24-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
1223D:												
Sandberg--------	0-7	Coarse sandy loam.	SM	A-2	0-3	0-5	85-100	50-95	50-65	25-35	15-20	NP-7
	7-13	Gravelly loamy coarse sand, gravelly coarse sand, loamy sand.	SP-SM, SM	A-1, A-2, A-3	0-3	0-5	75-95	50-95	35-70	5-25	---	NP-4
	13-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM	A-1, A-3, A-2	0-3	0-5	60-95	50-95	30-65	2-10	---	NP
Arvilla---------	0-10	Sandy loam-----	SM, SC, SC-SM	A-2, A-4, A-6	0	0	95-100	90-100	50-80	20-45	15-30	NP-15
	10-19	Sandy loam, loam, coarse sandy loam.	SM, SC, SC-SM	A-2, A-4, A-6	0	0	90-100	85-100	50-80	20-45	15-40	NP-15
	19-60	Gravelly coarse sand, coarse sand, very gravelly coarse sand.	SP-SM, GM, SP, GP-GM	A-1, A-2, A-3	0	0	35-100	25-100	10-60	0-15	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1227:												
Quam	0-33	Silt loam	OL, ML	A-7, A-4, A-6, A-5	0	0	100	100	80-100	70-95	30-50	5-20
	33-50	Silty clay loam, silt loam, loam.	CL, ML	A-7, A-6, A-4	0	0	100	100	80-100	70-95	30-50	5-25
	50-60	Clay loam, silty clay loam, silt loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	0	100	90-100	85-95	70-90	20-50	5-20
Cathro	0-12	Muck	PT	A-8	0	0	0	0	0	0	---	NP
	12-24	Muck	PT	A-8	0	0	0	0	0	0	---	NP
	24-60	Sandy loam, silt loam, clay loam.	SC-SM, CL-ML, SC, CL	A-4, A-6	0	0-5	80-100	65-100	60-100	35-90	20-40	4-20
Urness	0-20	Mucky silt loam	OL, CL, CL-ML	A-4, A-6, A-7	0	0	100	100	90-100	70-95	20-50	3-20
	20-45	Mucky silt loam, mucky silty clay loam, silty clay loam.	CL, CL-ML, OL	A-4, A-6, A-7	0	0	95-100	90-100	85-100	70-95	20-50	3-30
	45-60	Silty clay loam, very fine sandy loam, loam.	CL, ML	A-6, A-7	0	0-2	95-100	85-100	75-100	65-95	35-50	11-20
1230:												
Haslie	0-44	Muck	PT	A-8	0	0	0	0	0	0	---	NP
	44-60	Coprogenous earth, mucky silty clay.	OL	A-5	0	0	100	95-100	85-100	75-96	41-50	2-10
Nidaros	0-38	Muck	PT	A-8	0	0	0	0	0	0	---	NP
	38-54	Coarse sandy loam, sandy clay loam, loam.	SC-SM, SC, CL, CL-ML	A-6, A-2-6, A-4	0	0	95-100	85-100	45-95	25-70	21-40	NP-20
	54-60	Coarse sand, sand, gravelly coarse sand.	SP, SM, SP-SM, SW	A-1-b, A-3, A-2-4	0	0	60-100	50-100	30-70	3-15	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1232B:												
Chapett---------	0-8	Loam----------	ML, CL, CL-ML	A-4, A-6	0-1	0-5	95-100	85-95	55-85	50-70	15-30	3-15
	8-21	Sandy clay loam, sandy loam, loam.	ML, CL	A-4, A-6	0-1	0-5	95-100	85-95	55-85	55-70	20-40	8-20
	21-36	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
	36-60	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
1232E:												
Chapett---------	0-9	Loam----------	ML, CL, CL-ML	A-4, A-6	0-1	0-5	95-100	85-95	55-85	50-70	15-30	3-15
	9-26	Sandy clay loam, sandy loam, loam.	ML, CL	A-4, A-6	0-1	0-5	95-100	85-95	55-85	55-70	20-40	8-20
	26-33	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
	33-60	Fine sandy loam, loam, sandy loam.	SC, ML, CL, SM	A-4, A-6	0-1	0-5	95-100	85-95	50-85	35-65	15-30	3-12
1234B:												
Formdale--------	0-11	Clay loam------	CL	A-7, A-6	0	0-3	95-100	90-100	85-100	75-90	35-50	15-30
	11-18	Clay loam, loam	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	18-30	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
	30-60	Clay loam, silty clay loam, loam.	CL	A-7, A-6	0	0-3	95-100	90-100	85-95	70-80	35-50	15-30
Buse----------	0-8	Clay loam------	CL, ML	A-6, A-7	0	0	90-100	85-95	70-95	55-90	35-45	10-20
	8-27	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	90-100	85-100	70-90	55-85	25-45	5-20
	27-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	0	90-100	85-100	70-90	55-85	25-45	5-20

Engineering Index Properties--Continued

Map symbol and soil 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	
1237:												
Lakepark--------	0-9	Loam----------	ML, CL, CL-ML	A-4, A-6	0	0	100	95-100	90-100	65-90	20-40	2-15
	9-35	Clay loam, silty clay loam, silt loam.	ML, CL	A-4, A-6	0	0	100	95-100	90-100	65-90	30-40	2-12
	35-44	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0	0-5	95-100	95-100	85-100	65-90	30-45	15-30
	44-60	Clay loam, loam	CL	A-6	0	0-5	95-100	90-100	75-85	55-75	30-40	10-20
1239:												
Quam----------	0-9	Silt loam------	OL, ML	A-7, A-4, A-6, A-5	0	0	100	100	80-100	70-95	30-50	5-20
	9-56	Silty clay loam, silt loam, loam.	CL, ML	A-7, A-6, A-4	0	0	100	100	80-100	70-95	30-50	5-25
	56-80	Clay loam, silty clay loam, silt loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	0	100	90-100	85-95	70-90	20-50	5-20
1240:												
Roliss----------	0-14	Clay loam------	CL	A-6, A-7	0	0	95-100	80-100	80-100	60-80	35-50	15-25
	14-17	Loam, clay loam, silty clay loam.	CL	A-6, A-7	0	0	95-100	80-100	80-90	60-80	20-50	10-30
	17-27	Loam, clay loam	CL, CL-ML	A-6, A-7, A-4	0	0	95-100	80-100	80-95	60-80	20-50	5-30
	27-60	Loam, clay loam, silty clay loam.	CL, CL-ML	A-6, A-7, A-4	0	0	95-100	80-100	80-95	60-80	20-50	5-30
1247D:												
Corliss---------	0-7	Loamy coarse sand.	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	7-10	Loamy sand, gravelly sand, coarse sand.	SP-SM, SM, SP	A-1-b, A-2-4, A-3	0	0-5	75-95	50-85	35-70	2-25	15-21	NP-4
	10-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1247D:												
Dorset----------	0-8	Sandy loam-----	SM, SC-SM	A-4, A-2	0	0	90-100	85-100	50-70	25-50	0-25	NP-5
	8-17	Loam, sandy loam, coarse sandy loam.	SC-SM, SC, CL-ML, CL	A-4, A-6	0	0	90-100	85-100	50-90	35-75	15-30	4-14
	17-22	Gravelly loamy sand, gravelly loamy coarse sand, gravelly coarse sand.	SP-SM, SM, SC-SM, GM	A-1, A-2	0	0-5	50-90	35-75	20-50	10-25	0-20	NP-7
	22-60	Gravelly coarse sand, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	0	0-5	50-90	35-75	15-40	0-10	0-20	NP
1250C:												
Abbeylake-------	0-8	Loamy coarse sand.	SM, SP-SM	A-2-4	0	0	100	85-100	55-70	10-25	---	NP-4
	8-18	Sand, coarse sand, loamy sand.	SP, SP-SM, SM	A-3, A-2-4	0	0	100	85-100	55-75	2-15	---	NP-4
	18-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1	0	0	100	85-100	40-75	2-10	---	NP
Verndale--------	0-9	Coarse sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	9-17	Sandy loam, fine sandy loam, loam.	SC, SC-SM	A-4, A-2-4	0	0	98-100	85-100	60-85	25-45	20-26	5-10
	17-24	Sand, coarse sand, loamy coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP-2
	24-60	Sand, coarse sand.	SP, SP-SM	A-3, A-1-b, A-2-4	0	0	96-100	75-100	45-60	3-10	---	NP
1259:												
Hamerly---------	0-8	Clay loam------	CL	A-6, A-7	0	0-5	95-100	90-100	80-95	75-95	35-45	15-25
	8-40	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	80-95	60-75	25-45	10-25
	40-60	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	0-5	95-100	90-100	75-95	55-75	25-45	10-25

Engineering Index Properties--Continued

Map symbol and soil 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	
1259:												
Mustinka--------	0-8	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	70-95	40-52	20-30
	8-25	Silty clay, silty clay loam, clay.	CH, CL	A-7	0	0	100	100	90-100	75-95	47-72	25-44
	25-36	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0	0	100	95-100	85-100	70-95	31-47	12-25
	36-60	Clay loam, silty clay loam, loam.	CL, CH	A-4, A-5, A-6, A-7	0	0	95-100	85-98	75-95	50-90	31-47	12-25
1275B:												
Kandota---------	0-9	Sandy loam-----	SC-SM, SC	A-4, A-6	0	0-5	95-100	75-98	65-85	35-50	21-35	4-11
	9-11	Fine sandy loam, sandy loam, loamy sand.	SM, SC-SM, SC	A-4, A-2-4	0	0-5	95-100	75-98	45-85	20-65	15-28	NP-10
	11-45	Sandy clay loam, loam, fine sandy loam.	SC, CL	A-4, A-6	0	0-10	90-100	75-98	70-85	35-55	28-39	9-18
	45-57	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0-10	85-100	75-98	65-85	35-55	23-28	4-9
	57-80	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0-10	85-100	80-95	65-85	35-55	23-28	5-10
Egglake---------	0-6	Silt loam------	CL, ML, CL-ML	A-4, A-6	0-1	0-5	95-100	85-98	60-90	55-85	20-30	3-12
	6-12	Sandy loam, fine sandy loam, loam.	SM, SC-SM, CL-ML	A-2-4, A-4	0-1	0-5	95-100	85-98	60-85	30-65	15-25	2-6
	12-17	Sandy loam, loam.	SM, SC-SM, CL, CL-ML	A-4, A-2-4, A-2-6	0-1	0-5	90-100	85-98	60-85	30-65	20-30	6-15
	17-52	Sandy clay loam, loam, clay loam.	SC, CL	A-4, A-6	0-1	0-5	90-100	85-98	65-85	40-60	28-39	9-18
	52-80	Sandy loam, fine sandy loam, loam.	SM, SC-SM, SC, CL-ML	A-2-4, A-4, A-2-6	0-1	0-5	90-100	85-98	60-85	30-55	21-28	3-9

Engineering Index Properties--Continued

Map symbol and soil 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	
1275C:												
Kandota---------	0-9	Sandy loam-----	SC-SM, SC	A-4, A-6	0	0-5	95-100	75-98	65-85	35-50	21-35	4-11
	9-13	Fine sandy loam, sandy loam, loamy sand.	SM, SC-SM, SC	A-4, A-2-4	0	0-5	95-100	75-98	45-85	20-65	15-28	NP-10
	13-38	Sandy clay loam, loam, fine sandy loam.	SC, CL	A-4, A-6	0	0-10	90-100	75-98	70-85	35-55	28-39	9-18
	38-55	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0-10	85-100	75-98	65-85	35-55	23-28	4-9
	55-80	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0-10	85-100	80-95	65-85	35-55	23-28	5-10
Egglake---------	0-9	Loam----------	CL, ML, CL-ML	A-4, A-6	0-1	0-5	95-100	85-98	60-90	55-85	20-30	3-12
	9-14	Sandy loam, fine sandy loam, loam.	SM, SC-SM, CL-ML	A-2-4, A-4	0-1	0-5	95-100	85-98	60-85	30-65	15-25	2-6
	14-22	Sandy loam, loam.	SM, SC-SM, CL, CL-ML	A-4, A-2-4, A-2-6	0-1	0-5	90-100	85-98	60-85	30-65	20-30	6-15
	22-41	Sandy clay loam, loam, clay loam.	SC, CL	A-4, A-6	0-1	0-5	90-100	85-98	65-85	40-60	28-39	9-18
	41-80	Sandy loam, fine sandy loam, loam.	SM, SC-SM, SC, CL-ML	A-2-4, A-4, A-2-6	0-1	0-5	90-100	85-98	60-85	30-55	21-28	3-9
1276:												
Knute----------	0-10	Fine sandy loam	SM, SC, SC-SM	A-2-4, A-4	0	0-5	95-100	85-95	50-80	30-50	20-30	2-10
	10-12	Sandy clay loam, loam, fine sandy loam.	CL	A-4, A-6	0	0-5	95-100	85-95	55-85	55-70	30-40	8-20
	12-34	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-6	0	0-5	95-100	85-95	50-85	35-65	20-30	3-12
	34-48	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-6	0	0-5	95-100	85-95	50-85	35-65	15-25	3-12
	48-60	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-6	0	0-5	95-100	85-95	50-85	35-60	15-25	3-12

Engineering Index Properties--Continued

Map symbol and soil 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	
1276:												
Brandsvold------	0-11	Fine sandy loam	SC, SC-SM	A-4, A-2, A-6	0-1	0-5	95-100	80-95	60-80	30-50	20-30	5-15
	11-15	Fine sandy loam, sandy loam.	SC, SC-SM	A-4, A-2, A-6	0-1	0-5	95-100	80-95	60-80	30-50	20-30	5-15
	15-29	Sandy clay loam, loam, fine sandy loam.	CL, SC	A-4, A-6	0-1	0-5	95-100	80-95	70-85	45-65	30-40	10-20
	29-60	Fine sandy loam, loam, sandy loam.	CL-ML, ML, SC-SM, SM	A-4	0-1	0-5	95-100	80-95	65-85	35-60	20-30	5-10
1277D:												
Corliss---------	0-8	Loamy sand-----	SM, SP-SM	A-1-b, A-2-4	0	0-5	85-100	80-100	40-70	10-25	15-21	NP-4
	8-20	Loamy sand, gravelly sand, coarse sand.	SP-SM, SM, SP	A-1-b, A-2-4, A-3	0	0-5	75-95	50-85	35-70	2-25	15-21	NP-4
	20-60	Coarse sand, sand, gravelly coarse sand.	SP, SP-SM	A-1-b, A-3	0	0-5	60-95	50-85	30-65	2-10	---	NP
Sverdrup--------	0-9	Sandy loam-----	SM	A-4	0	0	100	95-100	60-70	35-50	---	NP
	9-25	Loam, sandy loam, loamy sand.	ML, SM	A-2, A-4	0	0	100	95-100	50-75	30-70	15-30	NP-5
	25-60	Sand, fine sand	SP, SP-SM	A-3, A-2	0	0	100	95-100	50-90	2-10	---	NP
1289:												
Knute----------	0-10	Fine sandy loam	SM, SC, SC-SM	A-2-4, A-4	0	0-5	95-100	85-95	50-80	30-50	20-30	2-10
	10-13	Sandy clay loam, loam, fine sandy loam.	CL	A-4, A-6	0	0-5	95-100	85-95	55-85	55-70	30-40	8-20
	13-41	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-6	0	0-5	95-100	85-95	50-85	35-65	20-30	3-12
	41-53	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-6	0	0-5	95-100	85-95	50-85	35-65	15-25	3-12
	53-60	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-6	0	0-5	95-100	85-95	50-85	35-65	15-25	3-12

Engineering Index Properties--Continued

Map symbol and soil 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	
1290:												
Brandsvold------	0-12	Fine sandy loam	SC, SC-SM	A-4, A-2, A-6	0-1	0-5	95-100	80-95	60-80	30-50	20-30	5-15
	12-17	Fine sandy loam, sandy loam.	SC, SC-SM	A-4, A-2, A-6	0-1	0-5	95-100	80-95	60-80	30-50	20-30	5-15
	17-37	Sandy clay loam, loam, fine sandy loam.	CL, SC	A-4, A-6	0-1	0-5	95-100	80-95	70-85	45-65	30-40	10-20
	37-45	Fine sandy loam, loam, sandy loam.	CL-ML, ML, SC-SM, SM	A-4	0-1	0-5	95-100	80-95	65-85	35-60	20-30	5-10
	45-80	Fine sandy loam, loam, sandy loam.	CL-ML, ML, SC-SM, SM	A-4	0-1	0-5	95-100	80-95	65-85	35-60	20-30	5-10
1291:												
Sedgeville------	0-8	Loam----------	CL, CL-ML, SC, SC-SM	A-4, A-6	0	0-5	80-100	75-100	65-100	45-85	20-35	4-15
	8-34	Silt loam, sandy loam, coarse sandy loam.	SM, SC, CL, SC-SM	A-2-4, A-4, A-1	0	0-5	80-100	75-100	35-100	20-90	15-30	3-10
	34-60	Sand, coarse sand, gravelly loamy coarse sand.	SP, SM, GP, SP-SM	A-1	0	0-5	80-100	50-100	15-25	1-20	---	NP
1293:												
Sedgeville------	0-21	Fine sandy loam	SM, SC-SM, ML, CL-ML	A-4, A-2-4, A-1-b	0	0-5	80-100	75-100	45-95	20-65	15-25	3-7
	21-40	Silt loam, sandy loam, coarse sandy loam.	SM, SC, CL, SC-SM	A-2-4, A-4, A-1	0	0-5	80-100	75-100	35-100	20-90	15-30	3-10
	40-60	Sand, coarse sand, gravelly loamy coarse sand.	SP, SM, GP, SP-SM	A-1	0	0-5	80-100	50-100	15-25	1-20	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1304A:												
Glyndon---------	0-16	Very fine sandy loam.	ML, CL-ML	A-4	0	0	100	100	95-100	70-95	20-30	NP-5
	16-29	Silt loam, very fine sandy loam, loam.	ML, CL-ML, CL	A-4	0	0	100	100	90-100	85-95	20-30	NP-10
	29-60	Loamy very fine sand, very fine sand, very fine sandy loam.	ML, SM, SC, CL	A-4	0	0	100	100	85-100	35-75	10-30	NP-10
1307:												
Rushlake--------	0-5	Sand----------	SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0	95-100	75-100	10-55	2-15	---	NP
	5-60	Gravelly sand, gravelly loamy sand, sand.	SP, SP-SM	A-1-b, A-3	0	0-3	55-95	50-90	15-60	2-10	---	NP
1317:												
Vallers---------	0-14	Silty clay loam	OL, CL, ML	A-6, A-7	0	0	95-100	95-100	95-100	85-95	30-50	11-20
	14-24	Clay loam, silty clay loam, sandy clay loam.	CL	A-6	0	0	95-100	90-100	80-95	50-80	30-40	11-20
	24-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	0	95-100	90-100	85-95	60-85	20-40	5-20
1319B:												
Rockwood--------	0-8	Sandy loam-----	SM	A-2, A-4	0	5-10	85-100	85-100	60-80	30-40	15-25	NP-4
	8-18	Sandy loam, loamy sand.	SM, SC-SM, SC	A-2, A-4	0	5-10	85-95	85-90	60-75	30-40	15-20	1-8
	18-26	Sandy loam-----	SM, SC-SM, SC	A-2, A-4	0	5-10	85-95	85-95	60-75	30-40	15-25	2-10
	26-42	Sandy loam-----	SM, SC-SM, SC	A-2, A-4	0	5-10	85-95	85-95	60-75	30-40	15-25	2-10
	42-60	Sandy loam, loamy sand.	SM, SC-SM, SC	A-2, A-4	0	5-10	85-95	80-90	60-75	25-40	15-25	2-10
1319C:												
Rockwood--------	0-9	Sandy loam-----	SM	A-2, A-4	0	5-10	85-100	85-100	60-80	30-40	15-25	NP-4
	9-16	Sandy loam, loamy sand.	SM, SC-SM, SC	A-2, A-4	0	5-10	85-95	85-90	60-75	30-40	15-20	1-8
	16-27	Sandy loam-----	SM, SC-SM, SC	A-2, A-4	0	5-10	85-95	85-95	60-75	30-40	15-25	2-10
	27-41	Sandy loam-----	SM, SC-SM, SC	A-2, A-4	0	5-10	85-95	85-95	60-75	30-40	15-25	2-10
	41-60	Sandy loam, loamy sand.	SM, SC-SM, SC	A-2, A-4	0	5-10	85-95	80-90	60-75	25-40	15-25	2-10

Engineering Index Properties--Continued

Map symbol and soil 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	
1319D:												
Rockwood--------	0-5	Sandy loam-----	SM	A-2, A-4	0	5-10	85-100	85-100	60-80	30-40	15-25	NP-4
	5-9	Sandy loam, loamy sand.	SM, SC-SM, SC	A-2, A-4	0	5-10	85-95	85-90	60-75	30-40	15-20	1-8
	9-38	Sandy loam-----	SM, SC-SM, SC	A-2, A-4	0	5-10	85-95	85-95	60-75	30-40	15-25	2-10
	38-45	Sandy loam-----	SM, SC-SM, SC	A-2, A-4	0	5-10	85-95	85-95	60-75	30-40	15-25	2-10
	45-60	Sandy loam, loamy sand.	SM, SC-SM, SC	A-2, A-4	0	5-10	85-95	80-90	60-75	25-40	15-25	2-10
1320B:												
Blowers---------	0-7	Sandy loam-----	SM, SC-SM	A-2, A-4	0	0-10	85-100	85-100	60-80	30-40	20-30	1-7
	7-19	Sandy loam-----	SM, SC-SM	A-2, A-4	0	0-10	85-95	85-90	60-75	30-40	15-20	1-5
	19-36	Sandy loam-----	SM, SC-SM, SC	A-2, A-4	0	0-10	85-95	85-95	60-75	30-40	15-25	2-10
	36-43	Sandy loam-----	SM, SC-SM, SC	A-2, A-4	0	0-10	85-95	80-95	60-75	30-40	15-25	2-10
	43-60	Sandy loam, loamy sand.	SM, SC-SM, SC	A-2, A-4	0	0-10	85-95	80-90	60-75	25-40	15-25	2-10
1321:												
Paddock---------	0-8	Fine sandy loam	SM, SC-SM	A-2, A-4	0	2-10	85-100	80-100	60-80	25-40	15-25	3-7
	8-15	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	0-10	85-95	85-90	60-75	25-40	0-20	NP-5
	15-40	Sandy loam-----	SM, SC-SM, SC	A-2, A-4	0	0-10	85-95	80-95	60-75	25-45	15-30	3-10
	40-60	Sandy loam, loamy sand.	SM, SC-SM, SC	A-2, A-4	0	0-10	85-90	80-90	60-75	25-40	15-25	NP-10
Becida----------	0-8	Loam----------	ML, CL	A-4, A-6	0-1	0-10	95-100	90-95	80-90	55-80	30-40	7-15
	8-13	Sandy loam, fine sandy loam, loamy sand.	SM, SC-SM	A-2, A-4	0-1	0-10	85-95	75-95	60-75	25-40	0-20	NP-5
	13-27	Sandy loam, fine sandy loam, loamy sand.	SM, SC-SM, SC	A-2, A-4	0-1	0-5	85-95	75-95	60-75	25-45	15-25	2-10
	27-58	Sandy loam, fine sandy loam, loamy sand.	SM, SC-SM, SC	A-2, A-4	0-1	0-5	85-95	75-95	60-75	25-40	15-25	2-10
	58-80	Sandy loam, fine sandy loam.	SM, SC, SC-SM	A-2, A-4	0-1	0-5	85-95	75-95	60-75	25-40	15-25	2-8

Engineering Index Properties--Continued

Map symbol and soil 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	
1322:												
Wolverton-------	0-16	Very fine sandy loam.	CL-ML, SC-SM, CL	A-4, A-6	0	0	100	100	90-100	40-90	15-30	4-11
	16-34	Loamy very fine sand, loamy fine sand, loamy sand.	SM, SC-SM	A-2-4, A-4	0	0	100	100	85-100	30-50	15-25	NP-7
	34-45	Loamy very fine sand, loamy fine sand, fine sand.	SM, SC-SM, SP-SM	A-2-4, A-4	0	0-3	100	90-100	75-90	10-50	15-21	NP-4
	45-80	Clay loam, silty clay loam, loam.	CL	A-4, A-6, A-7	0	1-10	95-100	90-100	50-90	50-80	28-43	9-21
1324B:												
Heimdal---------	0-8	Loam----------	ML, CL, CL-ML	A-4, A-6	0-1	0-1	95-100	85-95	55-85	50-70	20-35	3-15
	8-18	Loam, fine sandy loam, sandy loam.	SM, SC, ML, CL	A-4, A-6	0-1	0-1	95-100	85-95	50-80	35-65	15-30	3-15
	18-25	Fine sandy loam, loam, sandy loam.	SM, SC, ML, CL	A-4, A-6	0-1	0-1	95-100	85-95	50-80	35-65	15-30	2-12
	25-60	Fine sandy loam, loam, sandy loam.	SM, SC, ML, CL	A-4, A-6	0-1	0-3	95-100	85-95	50-80	35-65	15-30	2-12
Sisseton--------	0-8	Loam----------	ML, CL	A-4, A-6	0	0-5	95-100	90-100	90-100	60-75	30-40	5-15
	8-22	Loam, silt loam	ML, CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	75-100	60-90	20-40	3-15
	22-60	Stratified silt loam to sandy loam.	ML, CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	70-95	50-75	20-35	NP-15
1338:												
Oakcreek--------	0-14	Loam----------	CL-ML, ML	A-4	0	0	95-100	85-100	85-95	60-85	20-25	3-7
	14-33	Sandy clay loam, loam, silt loam.	SC, SC-SM, CL-ML, SM	A-4, A-2-4, A-1-b	0	0	95-100	85-100	50-80	15-65	20-30	4-9
	33-47	Loamy sand, loamy coarse sand, sand.	SP-SM, SM	A-3, A-2-4, A-4	0	0	80-100	50-85	10-65	10-45	0-20	NP-3
	47-80	Gravelly coarse sand, coarse sand, sand.	SW, SP-SM, GM, SP	A-3, A-1-b, A-2-4	0	0-2	55-100	50-85	10-50	2-35	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1339:												
Borup----------	0-10	Mucky silt loam	ML, OL	A-4, A-8	0	0	100	100	95-100	70-95	20-34	NP-7
	10-16	Very fine sandy loam, loamy very fine sand, silt loam.	ML	A-4	0	0	100	100	95-100	60-95	0-30	NP-5
	16-60	Loamy very fine sand, very fine sand, very fine sandy loam.	ML	A-4	0	0	100	100	85-100	50-90	0-30	NP-5
1340:												
Bluffcreek------	0-8	Sandy loam-----	SM, SC-SM	A-4, A-2-4, A-1-b	0	0-1	95-100	75-100	40-85	25-45	15-25	2-10
	8-31	Sandy loam, coarse sandy loam, gravelly sandy loam.	SM, SC-SM, SC, CL	A-2-4, A-4, A-1-b	0	0	60-95	50-95	30-80	25-70	20-30	3-12
	31-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM, SW, GP	A-2, A-3, A-1-b	0	0	50-95	50-95	20-55	2-15	---	NP
Epoufette-------	0-7	Sandy loam-----	SM, SC-SM	A-2, A-4	0	0-5	95-100	65-95	60-75	25-40	15-25	NP-7
	7-10	Loamy sand, sand, gravelly loamy sand.	SM, SP, SP-SM	A-2, A-3	0	0-5	95-100	65-95	50-75	0-30	---	NP
	10-22	Gravelly sandy loam, sandy loam, gravelly loamy sand.	SM, SC-SM, SC	A-2, A-4	0	0-5	95-100	70-95	60-80	25-40	15-25	2-10
	22-60	Gravelly sand, coarse sand, sand.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2-4	0	0-10	50-90	45-85	30-60	0-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1341:												
Clitherall------	0-11	Coarse sandy loam.	SM, SC-SM	A-2-4, A-4	0	0	95-100	85-98	50-85	15-70	15-20	3-9
	11-16	Coarse sandy loam, sandy loam, loam.	SC, SC-SM, CL-ML	A-4, A-2-4, A-1-b	0	0	95-100	85-100	50-85	15-70	15-30	4-14
	16-30	Gravelly coarse sandy loam, loamy sand, gravelly loamy sand.	SM, SP-SM, SC-SM	A-2-4, A-1-b, A-3	0	0-1	55-95	50-90	10-75	10-45	5-25	NP-9
	30-45	Gravelly loamy sand, gravelly sand, gravelly coarse sand.	SP-SM, SM, GP-GM	A-1-a, A-1-b, A-3	0	0-1	50-95	50-90	5-65	2-30	0-20	NP
	45-80	Fine sandy loam, sandy loam, loam.	SC, SC-SM, CL-ML	A-4, A-2-4	0	0-5	85-98	85-98	65-80	35-50	23-28	4-9
Wykeham---------	0-8	Sandy loam-----	SM, SC-SM	A-4	0	0-5	90-100	85-100	65-80	40-50	25-30	2-5
	8-17	Fine sandy loam, loamy sand, sandy loam.	SM, SC-SM	A-4, A-2	0	0-5	85-100	70-95	65-80	25-50	15-20	1-5
	17-32	Loam, sandy clay loam, sandy loam.	SC, CL	A-6	0	0-5	90-100	85-95	70-80	35-60	30-35	10-15
	32-60	Fine sandy loam, sandy loam.	SC-SM, SC	A-4	0	0-5	85-95	85-95	65-80	35-50	20-25	5-10
1342:												
Pinelake--------	0-10	Fine sandy loam	SM, SC-SM	A-4, A-2, A-2-4	0	0	100	85-100	45-95	30-50	15-30	3-9
	10-29	Sandy loam, loam, coarse sandy loam.	SC, CL, SC-SM, SM	A-4, A-6	0	0	95-100	85-100	50-85	40-70	23-30	5-9
	29-70	Loamy sand, gravelly loamy sand.	SP, SW, SP-SM, SW-SM	A-1-b, A-2-4, A-3	0	0-2	85-95	50-95	10-50	2-35	---	NP
	70-80	Sandy loam, sandy clay loam, loam.	SC, SC-SM, SM, CL	A-4, A-6, A-2-4	0	0-2	90-100	85-95	70-80	35-50	23-35	5-15

Engineering Index Properties--Continued

Map symbol and soil 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	
1342:												
Brandsvold------	0-10	Fine sandy loam	SC, SC-SM	A-4, A-2, A-6	0-1	0-5	95-100	80-95	60-80	30-50	20-30	5-15
	10-12	Fine sandy loam, sandy loam.	SC, SC-SM	A-4, A-2, A-6	0-1	0-5	95-100	80-95	60-80	30-50	20-30	5-15
	12-41	Sandy clay loam, loam, fine sandy loam.	CL, SC	A-4, A-6	0-1	0-5	95-100	80-95	70-85	45-65	30-40	10-20
	41-80	Fine sandy loam, loam, sandy loam.	CL-ML, ML, SC-SM, SM	A-4	0-1	0-5	95-100	80-95	65-85	35-60	20-30	5-10
1343C:												
Lida----------	0-8	Sandy loam-----	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	8-13	Loamy sand, loamy coarse sand, sandy loam.	SM, SP-SM	A-4, A-3, A-2-4	0	0-10	85-100	85-100	30-85	10-55	0-25	NP-7
	13-22	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	22-38	Loamy sand, gravelly loamy coarse sand, gravelly loamy sand.	GM, GP-GM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-5	50-85	50-85	20-65	5-25	---	NP
	38-80	Gravelly coarse sand, sand, gravelly sand.	GP, GW, GP-GM, SP	A-3, A-1-b, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1343C:												
Almora----------	0-9	Sandy loam-----	SC, SC-SM	A-4	0	0	95-100	85-100	45-75	35-50	23-30	6-11
	9-12	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0	95-100	85-100	45-85	35-65	23-30	6-11
	12-25	Sandy clay loam, gravelly sandy clay loam, loam.	SC, ML, CL	A-4, A-6	0	0-5	95-100	60-98	40-80	40-75	34-39	9-18
	25-28	Gravelly loamy coarse sand, sand, loamy sand.	SM, SP-SM, SC-SM	A-1-a, A-1-b, A-3	0	0-5	90-100	30-98	20-70	5-20	15-20	NP-6
	28-80	Gravelly coarse sand, sand, coarse sand.	SW, SP-SM, SP	A-1-a, A-1-b	0	0-5	90-100	30-98	5-30	0-10	---	NP
Lizzie----------	0-8	Very fine sandy loam.	SM, SC, SC-SM	A-4	0	0	100	97-100	75-95	35-65	15-28	NP-9
	8-18	Silt loam, silty clay loam, loam.	CL, ML	A-4, A-6	0	0	100	97-100	80-100	75-95	28-43	9-21
	18-42	Silt loam, loam, fine sandy loam.	CL, CL-ML	A-4, A-6	0	0	100	97-100	85-100	60-90	15-30	NP-11
	42-80	Very fine sandy loam, silt loam, loamy very fine sand.	CL-ML, SM, SC-SM	A-2-4, A-4	0	0	100	97-100	65-95	15-90	15-26	NP-8

Engineering Index Properties--Continued

Map symbol and soil 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	
1344B:												
Lida	0-7	Sandy loam	SC-SM, SM, SC, ML	A-4, A-2-4	0	0-10	85-100	85-100	30-85	15-55	0-28	NP-9
	7-23	Sandy loam, gravelly sandy loam, gravelly coarse sandy loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0-5	85-100	50-85	30-75	15-55	20-28	NP-9
	23-30	Loamy sand, gravelly loamy coarse sand, gravelly loamy sand.	GM, GP-GM, SP-SM, SM	A-1-b, A-2-4, A-4	0	0-5	50-85	50-85	20-65	5-25	---	NP
	30-80	Gravelly coarse sand, sand, gravelly sand.	GP, GW, GP-GM, SP	A-3, A-1-b, A-2-4	0	0-5	50-85	50-85	20-60	2-10	---	NP
Almora	0-10	Fine sandy loam	SC, SC-SM	A-4	0	0	95-100	85-100	45-75	35-50	23-30	6-11
	10-15	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0	95-100	85-100	45-85	35-65	23-30	6-11
	15-39	Sandy clay loam, gravelly sandy clay loam, loam.	SC, ML, CL	A-4, A-6	0	0-5	95-100	60-98	40-80	40-75	34-39	9-18
	39-80	Gravelly coarse sand, sand, coarse sand.	SW, SP-SM, SP	A-1-a, A-1-b	0	0-5	90-100	30-98	5-30	0-10	---	NP
Dent	0-15	Fine sandy loam	SM, SC, CL, SC-SM	A-4, A-2-4	0	0	100	95-100	75-95	35-65	15-30	3-10
	15-38	Silt loam, silty clay loam, loam.	CL, CL-ML, ML	A-4, A-6, A-7, A-5	0	0	100	95-100	80-100	75-95	30-50	10-25
	38-62	Silt loam, loam, very fine sandy loam.	CL, CL-ML, ML	A-4, A-6	0	0	100	95-100	85-100	60-95	20-40	3-17
	62-80	Very fine sandy loam, silt loam, loamy very fine sand.	CL-ML, ML, SM, SC-SM	A-2-4, A-4	0	0	100	95-100	65-100	15-90	15-32	NP-12

Engineering Index Properties--Continued

Map symbol and soil 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	
1345:												
Bluffcreek------	0-8	Sandy loam-----	SM, SC-SM	A-4, A-2-4, A-1-b	0	0-1	95-100	75-100	40-85	25-45	15-25	2-10
	8-19	Loamy sand, sand, loamy coarse sand.	SM, SP-SM	A-3, A-1-b, A-2-4	0	0-1	90-100	75-100	35-75	10-35	0-20	NP-5
	19-47	Sandy loam, coarse sandy loam, gravelly sandy loam.	SM, SC-SM, SC, CL	A-2-4, A-4, A-1-b	0	0	60-95	50-95	30-80	25-70	20-30	3-12
	47-60	Gravelly coarse sand, coarse sand, sand.	SP, SP-SM, SW, GP	A-2, A-3, A-1-b	0	0	50-95	50-95	20-55	2-15	---	NP
Rosy----------	0-9	Fine sandy loam	ML, SM, CL-ML, SC-SM	A-4	0	0	100	95-100	70-95	40-65	15-25	NP-6
	9-48	Loam, very fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SC	A-4, A-6	0	0	100	95-100	70-95	40-75	20-35	3-12
	48-60	Stratified sand to silty clay loam.	SM, SC, SC-SM, ML	A-4, A-2-4	0	0	95-100	95-100	60-95	30-75	15-35	2-12
1346:												
Nidaros---------	0-25	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	25-42	Mucky loam, sandy loam, sandy clay loam.	SC, CL, SC-SM, OL	A-6, A-2-6, A-2-4	0	0	95-100	85-100	20-85	20-75	20-45	5-25
	42-60	Coarse sand, loamy sand, gravelly coarse sand.	SP, SP-SM, SW-SM	A-1-b, A-3, A-2-4	0	0	60-100	60-100	10-70	3-20	---	NP

Engineering Index Properties--Continued

Map symbol and soil 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	
1347B:												
Kandota---------	0-8	Loam----------	SC-SM, CL, CL-ML	A-4, A-6	0	0-5	95-100	75-98	65-95	45-55	21-35	4-11
	8-11	Fine sandy loam, sandy loam, loamy sand.	SM, SC-SM, SC	A-4, A-2-4	0	0-5	95-100	75-98	45-85	20-65	15-28	NP-10
	11-26	Sandy clay loam, loam, fine sandy loam.	SC, CL	A-4, A-6	0	0-10	90-100	75-98	70-85	35-55	28-39	9-18
	26-46	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0-10	85-100	75-98	65-85	35-55	23-28	4-9
	46-80	Sandy loam, fine sandy loam, loam.	SC, SC-SM, CL-ML	A-4	0	0-10	85-100	80-95	65-85	35-55	23-28	5-10
1348:												
Knute----------	0-11	Loam----------	ML, CL, CL-ML	A-4, A-6	0	0-5	95-100	85-95	55-85	50-70	20-30	3-15
	11-16	Sandy clay loam, loam, fine sandy loam.	CL	A-4, A-6	0	0-5	95-100	85-95	55-85	55-70	30-40	8-20
	16-45	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-6	0	0-5	95-100	85-95	50-85	35-65	20-30	3-12
	45-65	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-6	0	0-5	95-100	85-95	50-85	35-65	15-25	3-12
	65-80	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-6	0	0-5	95-100	85-95	50-85	35-60	15-25	3-12
1349:												
Clotho----------	0-14	Loam----------	ML, CL	A-4, A-6	0	2-5	95-100	90-100	80-90	50-70	30-40	7-15
	14-28	Sandy loam, fine sandy loam, loam.	SM, SC-SM, ML, CL-ML	A-2, A-4, A-6	0	5-10	85-100	80-100	65-85	30-60	20-30	4-12
	28-60	Sandy loam, fine sandy loam, loam.	SM, SC-SM, ML, CL-ML	A-4, A-2, A-6	0	5-10	90-100	80-95	65-85	35-60	20-30	3-10

Engineering Index Properties--Continued

Map symbol and soil 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	
1350:												
Brandsvold------	0-13	Loam----------	CL, CL-ML	A-4, A-6	0-1	0-5	95-100	85-95	65-85	50-65	20-30	5-15
	13-61	Sandy clay loam, loam, fine sandy loam.	CL, SC	A-4, A-6	0-1	0-5	95-100	80-95	70-85	45-65	30-40	10-20
	61-80	Fine sandy loam, loam, sandy loam.	CL-ML, ML, SC-SM, SM	A-4	0-1	0-5	95-100	80-95	65-85	35-60	20-30	5-10
1351:												
Bluffton--------	0-10	Loam----------	CL, ML	A-6, A-7, A-4	0	0	98-100	85-100	85-95	50-80	30-45	10-20
	10-53	Fine sandy loam, loam, sandy clay loam.	SM, ML, CL, SC	A-4, A-6	0-2	0-3	95-100	85-100	70-90	40-60	20-35	3-18
	53-80	Loam, sandy clay loam, fine sandy loam.	CL, ML, SC, SM	A-6, A-4	0-2	0-5	90-100	85-100	70-90	40-65	20-40	3-20
1365:												
Hillview--------	0-7	Fine sandy loam	SM, SC, SC-SM	A-2, A-4, A-2-4	0	0	98-100	93-100	60-85	30-50	15-25	2-10
	7-15	Sandy loam, loamy fine sand, loamy sand.	SM, SC-SM, ML, CL-ML	A-2, A-2-4, A-4	0	0	98-100	93-100	45-85	20-60	10-20	NP-7
	15-29	Sandy loam, fine sandy loam, loam.	SM, SC, CL, ML	A-2, A-2-4, A-4	0	0	98-100	93-100	60-90	35-65	15-30	2-12
	29-60	Stratified very fine sandy loam to fine sand.	SM, SC-SM, ML, CL-ML	A-2, A-2-4, A-4	0	0	98-100	93-100	60-90	20-70	10-20	NP-7

Engineering Index Properties--Continued

Map symbol and soil 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	
1396:												
Sedgeville------	0-7	Loam----------	CL, CL-ML, SC, SC-SM	A-4, A-6	0	0-5	80-100	75-100	65-100	45-85	20-35	4-15
	7-24	Silt loam, sandy loam, coarse sandy loam.	SM, SC, CL, SC-SM	A-2-4, A-4, A-1	0	0-5	80-100	75-100	35-100	20-90	15-30	3-10
	24-60	Sand, coarse sand, gravelly loamy coarse sand.	SP, SM, GP, SP-SM	A-1	0	0-5	80-100	50-100	15-25	1-20	---	NP
Nidaros---------	0-21	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
	21-27	Sandy clay loam, sandy loam, loam.	SC, CL, CL-ML, SC-SM	A-6, A-2-6, A-4	0	0	95-100	85-100	50-95	30-75	21-40	NP-20
	27-80	Coarse sand, loamy sand, gravelly sand.	SP, SM, SP-SM, SW	A-1-b, A-3, A-2-4	0	0	60-100	50-100	30-70	3-30	---	NP
Aquolls---------	0-10	Loam----------	CL, CL-ML	A-4, A-6	0-5	0-5	95-100	85-100	65-80	50-65	20-30	5-15
	10-24	Sandy loam, sandy clay loam, loam.	CL, SC	A-4, A-6, A-2-4	0-1	0-5	95-100	80-95	65-85	30-65	25-40	10-20
	24-60	Variable-------	SP, SW, SM, ML	A-3, A-4, A-2-4	0-1	0-5	50-95	50-95	20-85	5-60	0-30	NP-10
1397:												
Bemidji---------	0-8	Loamy sand-----	SM, SP-SM, SP	A-2-4, A-2, A-1, A-3	0	0	100	85-100	60-85	10-35	0-20	NP-4
	8-36	Loamy sand, loamy coarse sand, sand.	SM, SP-SM, SP	A-2-4, A-3, A-2, A-1	0	0	100	75-100	60-85	10-35	0-20	NP-4
	36-45	Sandy loam, sandy clay loam, fine sandy loam.	SC, CL, CL-ML, SC-SM	A-4, A-6	0	0-1	100	85-100	70-85	35-65	20-35	10-20
	45-60	Sandy loam, fine sandy loam.	SC, SC-SM	A-4	0	0-1	100	85-100	70-85	35-60	15-25	5-10

Engineering Index Properties--Continued

Map symbol and soil 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	
1825B:												
Seelyeville-----	0-60	Muck----------	PT	A-8	0	0	0	0	0	0	---	NP
1874:												
Radium----------	0-11	Loamy sand-----	SM, SP-SM	A-2-4	0	0	95-100	95-100	50-70	5-20	0-15	NP
	11-18	Sand, loamy sand, gravelly loamy coarse sand.	SP, SM, SP-SM	A-1, A-2, A-3	0	0-5	75-100	65-95	35-60	3-15	0-15	NP
	18-24	Gravelly sand, gravelly coarse sand, very gravelly coarse sand.	GP, SP, SM, SP-SM	A-1	0	0-5	55-85	25-75	15-40	2-10	0-15	NP
	24-60	Sand, coarse sand, loamy sand.	SP, SM, SP-SM	A-1, A-2, A-3	0	0-5	75-90	75-90	40-80	2-10	---	NP
1943:												
Roscommon-------	0-6	Loamy sand-----	SM, SP-SM	A-2, A-3, A-4	0	0	100	95-100	50-75	5-40	0-14	NP
	6-60	Sand, loamy sand, coarse sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	85-100	40-70	0-15	0-14	NP
1975:												
Oylen----------	0-13	Sandy loam-----	SM, SC-SM	A-2-4, A-4	0	0	100	85-100	60-85	25-45	15-20	3-6
	13-22	Loam, sandy loam.	SC, SC-SM, CL, CL-ML	A-4	0	0	100	85-100	60-85	35-60	20-30	5-10
	22-26	Loamy sand, sand, coarse sand.	SM, SP-SM	A-3, A-2-4	0	0	98-100	85-100	50-65	5-20	---	NP
	26-60	Sand, coarse sand, gravelly sand.	SP, SP-SM	A-3, A-1-b, A-2-4	0	0	90-100	60-100	35-55	3-10	---	NP

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 soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
7A:												
Hubbard---------	0-20	4-10	1.45-1.60	6.00-20.00	0.08-0.12	Low------	2.0-5.0	0.15	0.15	5	2	134
	20-45	1-5	1.55-1.65	6.00-20.00	0.03-0.07	Low------	0.0-0.5	0.15	0.15			
	45-60	0-5	1.55-1.65	6.00-20.00	0.03-0.07	Low------	0.0-0.5	0.15	---			
7B:												
Hubbard---------	0-12	4-10	1.45-1.60	6.00-20.00	0.08-0.12	Low------	2.0-5.0	0.15	0.15	5	2	134
	12-42	1-5	1.55-1.65	6.00-20.00	0.03-0.07	Low------	0.0-0.5	0.15	0.15			
	42-60	0-5	1.55-1.65	6.00-20.00	0.03-0.07	Low------	0.0-0.5	0.15	---			
7C:												
Hubbard---------	0-9	4-10	1.45-1.60	6.00-20.00	0.08-0.12	Low------	2.0-5.0	0.15	0.15	5	2	134
	9-34	1-5	1.55-1.65	6.00-20.00	0.03-0.07	Low------	0.0-0.5	0.15	0.15			
	34-60	0-5	1.55-1.65	6.00-20.00	0.03-0.07	Low------	0.0-0.5	0.15	---			
26:												
Aazdahl---------	0-13	27-35	1.30-1.50	0.60-2.00	0.17-0.19	Moderate	4.0-6.0	0.24	0.24	5	6	48
	13-23	27-35	1.40-1.60	0.20-0.60	0.17-0.19	Moderate	1.0-3.0	0.37	0.37			
	23-36	24-35	1.50-1.65	0.20-0.60	0.14-0.17	Moderate	0.0-0.5	0.37	0.37			
	36-60	24-35	1.50-1.65	0.20-0.60	0.14-0.17	Moderate	0.0-0.5	0.37	0.37			
34:												
Parnell---------	0-18	27-40	1.20-1.30	0.20-0.60	0.18-0.22	Moderate	6.0-10	0.37	0.37	5	7	38
	18-50	35-60	1.20-1.30	0.06-0.20	0.13-0.19	High-----	1.0-5.0	0.37	0.37			
	50-60	35-45	1.20-1.40	0.06-0.20	0.11-0.19	High-----	0.0-0.5	0.43	0.43			
38B:												
Waukon----------	0-8	12-27	1.40-1.60	0.60-2.00	0.20-0.24	Moderate	2.0-6.0	0.24	0.24	5	6	48
	8-32	18-35	1.40-1.60	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.32	0.32			
	32-60	18-30	1.45-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32			
38C2:												
Waukon----------	0-8	12-27	1.40-1.60	0.60-2.00	0.20-0.24	Moderate	2.0-6.0	0.24	0.24	5	6	48
	8-27	18-35	1.40-1.60	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.32	0.32			
	27-60	18-30	1.45-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32			
38D2:												
Waukon----------	0-7	12-27	1.40-1.60	0.60-2.00	0.20-0.24	Moderate	2.0-6.0	0.24	0.24	5	6	48
	7-22	18-35	1.40-1.60	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.32	0.32			
	22-60	18-30	1.45-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32			
38E:												
Waukon----------	0-9	12-27	1.40-1.60	0.60-2.00	0.20-0.24	Moderate	2.0-6.0	0.24	0.24	5	6	48
	9-26	18-35	1.40-1.60	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.32	0.32			
	26-60	18-30	1.45-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32			
46:												
Borup-----------	0-13	15-27	1.20-1.40	2.00-6.00	0.20-0.23	Low------	4.0-8.0	0.28	0.28	5	4L	86
	13-32	10-18	1.30-1.50	2.00-6.00	0.17-0.20	Low------	1.0-3.0	0.32	0.32			
	32-60	5-18	1.35-1.65	2.00-20.00	0.15-0.19	Low------	0.0-0.5	0.24	0.24			
53B:												
Kandota---------	0-8	10-20	1.35-1.60	0.60-6.00	0.14-0.17	Low------	2.0-4.0	0.20	0.20	5	3	86
	8-11	5-18	1.35-1.65	0.60-6.00	0.11-0.17	Low------	0.5-1.0	0.24	0.24			
	11-32	18-30	1.50-1.75	0.60-2.00	0.16-0.19	Low------	0.0-0.5	0.32	0.32			
	32-68	12-18	1.40-1.65	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.28	0.28			
	68-80	7-18	1.50-1.65	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.28	0.28			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
53C:												
Kandota---------	0-8	10-20	1.35-1.60	0.60-6.00	0.14-0.17	Low------	2.0-4.0	0.20	0.20	5	3	86
	8-24	18-30	1.50-1.75	0.60-2.00	0.16-0.19	Low------	0.0-0.5	0.32	0.32			
	24-60	7-18	1.50-1.65	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.28	0.28			
53D:												
Kandota---------	0-7	10-20	1.35-1.60	0.60-6.00	0.14-0.17	Low------	2.0-4.0	0.20	0.20	5	3	86
	7-9	5-18	1.35-1.65	0.60-6.00	0.11-0.17	Low------	0.5-1.0	0.24	0.24			
	9-28	18-30	1.50-1.75	0.60-2.00	0.16-0.19	Low------	0.0-0.5	0.32	0.32			
	28-60	7-18	1.50-1.65	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.28	0.28			
58:												
Kittson---------	0-7	10-27	1.30-1.45	0.60-2.00	0.20-0.22	Low------	4.0-6.0	0.24	0.24	5	5	56
	7-18	18-30	1.35-1.55	0.60-2.00	0.17-0.19	Low------	1.0-3.0	0.32	0.32			
	18-32	18-30	1.40-1.65	0.20-2.00	0.15-0.18	Moderate	0.0-0.5	0.32	0.32			
	32-60	18-30	1.40-1.65	0.20-2.00	0.15-0.18	Moderate	0.0-0.5	0.32	0.32			
59:												
Grimstad--------	0-10	10-18	1.30-1.45	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.20	0.20	5	3	86
	10-27	2-15	1.45-1.60	6.00-20.00	0.08-0.14	Low------	1.0-2.0	0.20	0.20			
	27-60	10-30	1.50-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.37	0.37			
61:												
Arveson---------	0-10	20-27	1.20-1.35	0.60-2.00	0.16-0.18	Low------	5.0-8.0	0.24	0.24	5	4L	86
	10-30	10-27	1.40-1.55	0.60-6.00	0.15-0.17	Low------	1.0-5.0	0.24	0.24			
	30-60	5-20	1.50-1.65	2.00-20.00	0.05-0.15	Low------	0.5-1.0	0.17	0.17			
63:												
Rockwell--------	0-10	20-30	1.20-1.45	0.60-2.00	0.18-0.22	Low------	4.0-8.0	0.24	0.24	5	4L	86
	10-27	5-30	1.35-1.50	2.00-6.00	0.15-0.17	Low------	0.5-1.0	0.24	0.24			
	27-36	3-10	1.40-1.60	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.24	0.24			
	36-60	15-30	1.40-1.60	0.20-2.00	0.18-0.22	Low------	0.0-0.5	0.24	0.24			
65:												
Foxhome---------	0-13	10-20	1.35-1.50	2.00-6.00	0.13-0.18	Low------	3.0-7.0	0.20	0.20	3	3	86
	13-16	10-25	1.35-1.50	2.00-20.00	0.09-0.19	Low------	1.0-3.0	0.17	0.24			
	16-35	5-15	1.50-1.70	6.00-20.00	0.02-0.07	Low------	0.5-1.0	0.05	0.15			
	35-60	12-35	1.40-1.70	0.60-2.00	0.15-0.22	Low------	0.0-0.5	0.32	0.37			
66:												
Flaming---------	0-16	2-10	1.40-1.55	6.00-20.00	0.11-0.13	Low------	2.0-4.0	0.17	0.17	5	2	134
	16-60	2-10	1.50-1.70	6.00-20.00	0.06-0.10	Low------	0.5-1.0	0.17	0.17			
68:												
Arveson---------	0-16	20-27	1.20-1.35	0.60-2.00	0.16-0.18	Low------	6.0-10	0.24	0.24	5	4L	86
	16-23	10-27	1.40-1.55	0.60-6.00	0.15-0.17	Low------	0.5-1.0	0.24	0.24			
	23-60	5-20	1.50-1.65	2.00-20.00	0.05-0.15	Low------	0.0-0.5	0.17	0.17			
107:												
Winger----------	0-16	18-27	1.20-1.40	0.60-2.00	0.22-0.24	Low------	4.0-6.0	0.28	0.28	5	4L	86
	16-29	18-35	1.30-1.50	0.60-2.00	0.22-0.24	Low------	0.5-2.0	0.28	0.28			
	29-60	18-32	1.50-1.70	0.20-2.00	0.14-0.19	Low------	0.0-0.5	0.28	0.28			
108:												
McIntosh--------	0-12	18-27	1.35-1.50	0.60-2.00	0.20-0.24	Low------	4.0-7.0	0.28	0.28	5	4L	86
	12-25	18-35	1.40-1.50	0.60-2.00	0.16-0.22	Moderate	0.5-1.0	0.43	0.43			
	25-60	18-35	1.30-1.60	0.20-2.00	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
121:												
Wykeham---------	0-8	5-18	1.30-1.55	0.60-6.00	0.13-0.18	Low------	2.0-6.0	0.17	0.20	5	3	86
	8-14	5-15	1.50-1.70	0.60-2.00	0.10-0.17	Low------	1.0-2.0	0.24	0.28			
	14-28	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.5-1.0	0.24	0.28			
	28-60	10-18	1.55-1.75	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.24	0.28			
127A:												
Sverdrup--------	0-7	10-18	1.35-1.50	2.00-6.00	0.13-0.15	Low------	2.0-4.0	0.20	0.20	4	3	86
	7-17	6-18	1.40-1.55	2.00-6.00	0.08-0.14	Low------	0.5-2.0	0.20	0.20			
	17-60	0-10	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.15	0.15			
127B:												
Sverdrup--------	0-12	10-18	1.35-1.50	2.00-6.00	0.13-0.15	Low------	2.0-4.0	0.20	0.20	4	3	86
	12-24	6-18	1.40-1.55	2.00-6.00	0.08-0.14	Low------	0.5-2.0	0.20	0.20			
	24-60	0-10	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.15	0.15			
127C:												
Sverdrup--------	0-8	10-18	1.35-1.50	2.00-6.00	0.13-0.15	Low------	2.0-4.0	0.20	0.20	4	3	86
	8-15	6-18	1.40-1.55	2.00-6.00	0.08-0.14	Low------	0.5-2.0	0.20	0.20			
	15-60	0-10	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.15	0.15			
141B:												
Egeland---------	0-15	10-18	1.25-1.35	2.00-6.00	0.11-0.17	Low------	1.0-3.0	0.20	0.20	5	3	86
	15-42	10-18	1.30-1.45	2.00-6.00	0.09-0.15	Low------	0.5-2.0	0.20	0.20			
	42-60	5-10	1.40-1.65	2.00-6.00	0.08-0.10	Low------	0.0-0.5	0.17	0.17			
141C:												
Egeland---------	0-11	10-18	1.25-1.35	2.00-6.00	0.11-0.17	Low------	1.0-3.0	0.20	0.20	5	3	86
	11-35	10-18	1.30-1.45	2.00-6.00	0.09-0.15	Low------	0.5-2.0	0.20	0.20			
	35-60	5-10	1.40-1.65	2.00-6.00	0.08-0.10	Low------	0.0-0.5	0.17	0.17			
141D:												
Egeland---------	0-9	10-18	1.25-1.35	2.00-6.00	0.11-0.17	Low------	1.0-3.0	0.20	0.20	5	3	86
	9-30	10-18	1.30-1.45	2.00-6.00	0.09-0.15	Low------	0.5-2.0	0.20	0.20			
	30-60	5-10	1.40-1.65	2.00-6.00	0.08-0.10	Low------	0.0-0.5	0.17	0.17			
168B:												
Forman----------	0-9	27-30	1.20-1.40	0.60-2.00	0.17-0.19	Moderate	4.0-8.0	0.24	0.28	5	6	48
	9-24	30-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.28	0.32			
	24-60	18-35	1.30-1.50	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.43			
180:												
Gonvick---------	0-15	10-27	1.30-1.45	0.60-2.00	0.20-0.22	Moderate	2.0-5.0	0.24	0.24	5	6	48
	15-35	22-35	1.35-1.50	0.20-2.00	0.15-0.19	Moderate	1.0-3.0	0.32	0.32			
	35-60	18-35	1.40-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32			
184:												
Hamerly---------	0-10	18-27	1.20-1.60	0.60-2.00	0.20-0.24	Low------	4.0-7.0	0.28	0.28	5	4L	86
	10-38	18-30	1.20-1.60	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.28	0.32			
	38-60	18-30	1.30-1.60	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.37	0.37			
187:												
Haug----------	0-14	---	0.13-0.42	0.60-6.00	0.35-0.48	---------	50-90	---	---	5	2	134
	14-20	10-18	1.20-1.60	0.60-6.00	0.12-0.24	Low------	4.0-6.0	0.20	0.20			
	20-60	10-18	1.40-1.60	0.60-2.00	0.11-0.19	Low------	0.5-1.0	0.20	0.20			
191:												
Epoufette-------	0-7	5-15	1.35-1.50	2.00-6.00	0.09-0.14	Low------	2.0-6.0	0.20	---	4	3	86
	7-33	8-18	1.40-1.60	2.00-6.00	0.08-0.14	Low------	0.0-0.5	0.17	0.17			
	33-60	0-8	1.40-1.65	>20.00	0.01-0.03	Low------	0.0-0.5	0.10	0.15			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
202:												
Meehan----------	0-8	4-10	1.35-1.65	2.00-6.00	0.10-0.12	Low------	0.5-3.0	0.17	0.17	5	2	134
	8-24	4-9	1.60-1.70	6.00-20.00	0.06-0.11	Low------	0.0-0.5	0.15	0.15			
	24-60	1-4	1.60-1.70	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.15	0.15			
258A:												
Sandberg--------	0-11	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2	134
	11-33	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.5-1.0	0.05	0.10			
	33-60	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.0-0.5	0.05	0.10			
258B:												
Sandberg--------	0-12	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2	134
	12-19	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.5-1.0	0.05	0.10			
	19-29	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.5-1.0	0.05	0.10			
	29-80	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.0-0.5	0.05	0.10			
258C:												
Sandberg--------	0-10	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2	134
	10-17	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.5-1.0	0.05	0.10			
	17-44	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.5-1.0	0.05	0.10			
	44-60	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.0-0.5	0.05	0.10			
260:												
Duelm----------	0-16	2-10	1.40-1.60	6.00-20.00	0.08-0.12	Low------	2.0-6.0	0.17	0.17	5	2	134
	16-56	1-8	1.55-1.65	6.00-20.00	0.06-0.11	Low------	0.0-0.5	0.15	0.15			
	56-60	0-6	1.55-1.65	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.15	0.15			
267B:												
Snellman--------	0-9	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3	86
	9-15	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28			
	15-31	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28			
	31-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
267C:												
Snellman--------	0-7	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3	86
	7-15	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28			
	15-31	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28			
	31-45	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
	45-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
267E:												
Snellman--------	0-3	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3	86
	3-14	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28			
	14-26	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28			
	26-39	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
	39-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
267F:												
Snellman--------	0-3	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3	86
	3-16	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28			
	16-32	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28			
	32-40	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
	40-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
290:												
Rothsay---------	0-14	10-18	1.20-1.40	0.60-2.00	0.22-0.24	Low------	3.0-6.0	0.32	0.32	5	5	56
	14-22	10-18	1.20-1.40	0.60-2.00	0.17-0.22	Low------	0.5-1.0	0.43	0.43			
	22-31	5-18	1.20-1.40	0.60-6.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
	31-60	5-18	1.20-1.40	0.60-6.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
293B:												
Swenoda---------	0-15	10-20	1.25-1.35	2.00-6.00	0.11-0.17	Low------	2.0-7.0	0.20	0.20	5	3	86
	15-29	10-18	1.30-1.45	2.00-6.00	0.11-0.17	Low------	1.0-3.0	0.20	0.20			
	29-60	20-35	1.35-1.65	0.20-2.00	0.17-0.20	Moderate	0.0-1.0	0.43	0.43			
335:												
Urness----------	0-9	18-27	0.25-0.50	0.20-2.00	0.18-0.24	Moderate	10-50	0.28	0.28	5	4L	86
	9-60	18-35	0.30-1.00	0.20-2.00	0.16-0.22	Moderate	10-50	0.28	0.28			
339:												
Fordville-------	0-10	18-25	1.20-1.30	0.60-2.00	0.18-0.20	Low------	3.0-7.0	0.24	0.24	4	6	48
	10-29	18-30	1.25-1.40	0.60-2.00	0.18-0.21	Moderate	1.0-4.0	0.28	0.28			
	29-37	15-30	1.25-1.45	0.60-6.00	0.12-0.18	Low------	0.0-2.0	0.28	0.28			
	37-60	0-5	1.60-1.80	6.00-60.00	0.03-0.06	Low------	0.0-0.5	0.10	0.17			
341A:												
Arvilla---------	0-13	6-18	1.40-1.60	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.20	0.20	3	3	86
	13-20	6-18	1.40-1.60	2.00-6.00	0.11-0.14	Low------	1.0-2.0	0.20	0.20			
	20-60	2-10	1.40-1.60	6.00-20.00	0.02-0.05	Low------	0.0-0.5	0.10	0.20			
341B:												
Arvilla---------	0-9	6-18	1.40-1.60	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.20	0.20	3	3	86
	9-19	6-18	1.40-1.60	2.00-6.00	0.11-0.14	Low------	1.0-2.0	0.20	0.20			
	19-60	2-10	1.40-1.60	6.00-20.00	0.02-0.05	Low------	0.0-0.5	0.10	0.20			
371:												
Clontarf--------	0-13	10-18	1.35-1.55	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.20	0.20	4	3	86
	13-24	10-18	1.45-1.60	2.00-6.00	0.12-0.19	Low------	0.5-1.0	0.20	0.20			
	24-60	5-10	1.55-1.70	6.00-20.00	0.05-0.09	Low------	0.0-0.5	0.15	0.15			
375:												
Forada----------	0-18	10-22	1.20-1.40	0.60-2.00	0.20-0.22	Low------	5.0-9.0	0.24	0.24	4	5	56
	18-36	8-18	1.30-1.50	0.60-6.00	0.12-0.19	Low------	0.5-1.0	0.28	0.28			
	36-60	0-5	1.50-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.15	0.17			
402C:												
Sioux-----------	0-10	3-10	1.40-1.50	2.00-6.00	0.08-0.12	Low------	1.0-2.0	0.17	0.17	2	2	134
	10-60	0-10	1.60-1.70	6.00-20.00	0.03-0.06	Low------	0.0-0.5	0.10	0.32			
402E:												
Sioux-----------	0-10	3-10	1.40-1.50	2.00-6.00	0.08-0.12	Low------	1.0-2.0	0.17	0.17	2	2	134
	10-60	0-10	1.60-1.70	6.00-20.00	0.03-0.06	Low------	0.0-0.5	0.10	0.32			
406A:												
Dorset----------	0-11	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3	86
	11-20	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28			
	20-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15			
406B:												
Dorset----------	0-11	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3	86
	11-20	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28			
	20-38	5-10	1.55-1.65	6.00-20.00	0.06-0.10	Low------	0.0-0.5	0.10	0.17			
	38-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15			
418:												
Lamoure---------	0-32	27-34	1.15-1.25	0.20-2.00	0.19-0.22	Moderate	4.0-8.0	0.28	0.28	5	4L	86
	32-40	20-34	1.20-1.35	0.20-2.00	0.17-0.20	Moderate	1.0-3.0	0.32	0.32			
	40-48	20-34	1.20-1.35	0.20-2.00	0.17-0.20	Moderate	0.5-1.0	0.43	0.43			
	48-60	20-34	1.25-1.40	0.20-2.00	0.09-0.18	Moderate	0.0-0.5	0.28	0.28			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
422B:												
Bygland---------	0-10	27-40	1.20-1.40	0.20-0.60	0.18-0.22	High-----	4.0-8.0	0.28	0.28	5	7	38
	10-41	35-60	1.20-1.40	0.06-0.60	0.10-0.19	High-----	1.0-3.0	0.32	0.32			
	41-46	18-40	1.30-1.50	0.20-0.60	0.16-0.22	Moderate	0.5-1.0	0.43	0.43			
	46-60	18-40	1.30-1.50	0.20-0.60	0.16-0.22	Moderate	0.0-0.5	0.43	0.43			
422C:												
Bygland---------	0-8	27-40	1.20-1.40	0.20-0.60	0.18-0.22	High-----	4.0-8.0	0.28	0.28	5	7	38
	8-16	35-60	1.20-1.40	0.06-0.60	0.10-0.19	High-----	1.0-3.0	0.32	0.32			
	16-22	18-40	1.30-1.50	0.20-0.60	0.16-0.22	Moderate	0.5-1.0	0.43	0.43			
	22-60	18-40	1.30-1.50	0.20-0.60	0.16-0.22	Moderate	0.0-0.5	0.43	0.43			
426:												
Foldahl---------	0-14	4-9	1.40-1.55	6.00-20.00	0.10-0.14	Low------	1.0-4.0	0.20	0.20	5	2	134
	14-26	2-10	1.45-1.60	6.00-20.00	0.07-0.12	Low------	0.5-1.0	0.20	0.20			
	26-40	18-35	1.50-1.65	0.20-2.00	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			
	40-60	18-35	1.50-1.65	0.20-2.00	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			
441A:												
Almora----------	0-11	12-20	1.30-1.55	0.60-2.00	0.20-0.22	Low------	3.0-5.0	0.24	0.24	4	5	56
	11-15	12-20	1.30-1.55	0.60-2.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28			
	15-38	18-30	1.30-1.55	0.60-2.00	0.14-0.19	Moderate	0.5-1.0	0.32	0.32			
	38-46	3-12	1.55-1.65	6.00-20.00	0.02-0.11	Low------	0.0-0.5	0.10	0.15			
	46-60	1-4	1.55-1.65	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.10	0.15			
441B:												
Almora----------	0-9	12-20	1.30-1.55	0.60-2.00	0.20-0.22	Low------	3.0-5.0	0.24	0.24	4	5	56
	9-13	12-20	1.30-1.55	0.60-2.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28			
	13-27	18-30	1.30-1.55	0.60-2.00	0.14-0.19	Moderate	0.5-1.0	0.32	0.32			
	27-60	1-4	1.55-1.65	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.10	0.15			
441C:												
Almora----------	0-10	12-20	1.30-1.55	0.60-2.00	0.20-0.22	Low------	3.0-5.0	0.24	0.24	4	5	56
	10-13	12-20	1.30-1.55	0.60-2.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28			
	13-33	18-30	1.30-1.55	0.60-2.00	0.14-0.19	Moderate	0.5-1.0	0.32	0.32			
	33-60	1-4	1.55-1.65	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.10	0.15			
481:												
Kratka----------	0-9	5-15	1.20-1.50	2.00-6.00	0.13-0.18	Low------	2.0-5.0	0.20	0.20	5	3	86
	9-25	2-10	1.30-1.60	6.00-20.00	0.06-0.11	Low------	0.5-1.0	0.17	0.17			
	25-60	10-35	1.50-1.80	0.20-2.00	0.11-0.19	Moderate	0.0-0.5	0.37	0.37			
494:												
Darnen----------	0-36	18-27	1.25-1.40	0.60-2.00	0.20-0.24	Low------	4.0-9.0	0.28	0.28	5	6	48
	36-43	18-30	1.40-1.60	0.60-2.00	0.15-0.19	Moderate	1.0-3.0	0.28	0.28			
	43-60	18-30	1.55-1.65	0.60-2.00	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			
497:												
Hantho----------	0-9	10-27	1.20-1.40	0.20-2.00	0.22-0.24	Low------	4.0-6.0	0.28	0.28	5	5	56
	9-22	10-18	1.30-1.50	0.60-2.00	0.17-0.22	Low------	2.0-4.0	0.28	0.28			
	22-31	10-18	1.30-1.55	0.60-2.00	0.17-0.22	Low------	0.0-1.0	0.43	0.43			
	31-60	10-35	1.30-1.60	0.60-2.00	0.17-0.22	Low------	0.0-0.5	0.43	0.43			
508:												
Wyndmere--------	0-12	5-15	1.10-1.35	2.00-6.00	0.13-0.18	Low------	5.0-8.0	0.20	0.20	5	3	86
	12-38	3-15	1.30-1.50	2.00-6.00	0.12-0.17	Low------	1.0-5.0	0.24	0.24			
	38-60	3-15	1.30-1.70	2.00-20.00	0.05-0.16	Low------	0.0-1.0	0.24	0.24			
540:												
Seelyeville-----	0-8	---	0.10-0.25	0.20-6.00	0.35-0.45	---------	25-99	---	---	3	2	134
	8-80	---	0.10-0.25	0.20-6.00	0.35-0.45	---------	25-99	---	---			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
541:												
Rifle----------	0-21	---	0.20-0.35	0.60-6.00	0.48-0.58	---------	75-99	---	---	3	5	56
	21-80	---	0.08-0.20	0.60-6.00	0.48-0.58	---------	25-99	---	---			
544:												
Cathro----------	0-16	---	0.28-0.45	0.20-6.00	0.45-0.55	---------	60-85	---	---	2	2	134
	16-38	---	0.15-0.30	0.20-6.00	0.35-0.45	---------	60-85	---	---			
	38-60	10-30	1.50-1.70	0.20-2.00	0.11-0.22	Low------	1.0-5.0	0.20	0.24			
567A:												
Verndale--------	0-9	7-12	1.50-1.70	2.00-6.00	0.13-0.17	Low------	2.0-4.0	0.20	0.20	3	3	86
	9-21	7-18	1.60-1.70	0.60-2.00	0.14-0.18	Low------	0.5-1.0	0.24	0.24			
	21-38	2-6	1.45-1.60	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.10	0.10			
	38-60	0-4	1.45-1.60	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.10			
567B:												
Verndale--------	0-10	7-12	1.50-1.70	2.00-6.00	0.13-0.17	Low------	2.0-4.0	0.20	0.20	3	3	86
	10-18	7-18	1.60-1.70	0.60-2.00	0.14-0.18	Low------	0.5-1.0	0.24	0.24			
	18-29	2-6	1.45-1.60	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.10	0.10			
	29-60	0-4	1.45-1.60	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.10			
609B:												
Dickey----------	0-13	2-14	1.40-1.60	6.00-20.00	0.08-0.12	Low------	1.0-3.0	0.17	0.17	5	2	134
	13-28	2-14	1.40-1.60	6.00-20.00	0.06-0.12	Low------	---	0.17	0.17			
	28-60	18-39	1.30-1.70	0.20-2.00	0.14-0.19	Moderate	---	0.37	0.37			
624:												
Rosy----------	0-9	3-12	1.40-1.55	0.60-2.00	0.14-0.19	Low------	0.5-2.0	0.24	0.24	5	3	86
	9-26	8-18	1.50-1.65	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.28	0.28			
	26-60	6-18	1.55-1.70	0.60-2.00	0.11-0.17	Low------	0.0-0.5	0.28	0.28			
646C:												
Peever----------	0-9	27-35	1.25-1.35	0.20-0.60	0.19-0.22	Moderate	3.0-6.0	0.24	0.24	5	6	48
	9-18	35-50	1.25-1.40	0.06-0.60	0.11-0.19	High-----	1.0-4.0	0.37	0.37			
	18-37	30-45	1.50-1.70	0.06-0.60	0.08-0.17	High-----	0.0-1.0	0.37	0.37			
	37-60	30-45	1.50-1.70	0.06-0.60	0.08-0.17	High-----	0.0-0.5	0.37	0.37			
646D:												
Peever----------	0-8	27-35	1.25-1.35	0.20-0.60	0.19-0.22	Moderate	3.0-6.0	0.24	0.24	5	6	48
	8-21	35-50	1.25-1.40	0.06-0.60	0.11-0.19	High-----	1.0-4.0	0.37	0.37			
	21-60	30-45	1.50-1.70	0.06-0.60	0.08-0.17	High-----	0.0-0.5	0.37	0.37			
670:												
Knute----------	0-9	10-18	1.35-1.65	0.60-2.00	0.13-0.18	Low------	2.0-4.0	0.20	0.20	5	3	86
	9-22	18-28	1.30-1.65	0.60-2.00	0.15-0.19	Low------	1.0-2.0	0.32	0.32			
	22-29	10-18	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.5-1.0	0.28	0.28			
	29-60	10-18	1.45-1.70	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
680:												
Parnell---------	0-27	22-27	1.25-1.35	0.60-2.00	0.20-0.24	Low------	5.0-8.0	0.28	0.28	5	6	48
	27-49	35-60	1.45-1.65	0.06-0.20	0.13-0.19	High-----	1.0-5.0	0.28	0.28			
	49-60	22-40	1.50-1.70	0.06-0.60	0.14-0.19	Moderate	0.0-0.5	0.28	0.28			
698:												
Doran----------	0-9	27-35	1.25-1.45	0.20-0.60	0.18-0.23	Moderate	4.0-8.0	0.32	0.32	5	6	48
	9-19	35-50	1.30-1.60	0.06-0.60	0.15-0.19	High-----	0.5-3.0	0.32	0.32			
	19-32	20-40	1.45-1.65	0.06-0.20	0.14-0.16	High-----	0.5-1.0	0.37	0.37			
	32-60	20-40	1.45-1.65	0.20-2.00	0.14-0.16	High-----	0.0-0.5	0.37	0.37			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
701:												
Runeberg--------	0-10	10-25	1.40-1.55	0.60-2.00	0.18-0.25	Low------	4.0-12	0.24	0.24	5	5	56
	10-36	10-18	1.60-1.75	0.20-0.60	0.12-0.18	Low------	0.5-2.0	0.24	0.24			
	36-60	6-15	1.65-1.75	0.06-0.60	0.06-0.13	Low------	0.0-0.5	0.24	0.24			
705B:												
Nitche----------	0-16	8-18	1.45-1.65	2.00-6.00	0.13-0.19	Low------	3.0-5.0	0.20	0.20	4	3	86
	16-24	8-18	1.45-1.65	0.60-6.00	0.12-0.19	Low------	0.5-1.0	0.17	0.24			
	24-33	5-10	1.55-1.65	6.00-20.00	0.06-0.10	Low------	0.0-0.5	0.10	0.17			
	33-55	1-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.05	0.15			
	55-80	10-18	1.65-1.80	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.24	0.24			
Kandota---------	0-7	10-20	1.35-1.60	0.60-6.00	0.14-0.17	Low------	2.0-4.0	0.20	0.20	5	3	86
	7-11	5-18	1.35-1.65	0.60-6.00	0.11-0.17	Low------	0.5-1.0	0.24	0.24			
	11-28	18-30	1.50-1.75	0.60-2.00	0.16-0.19	Low------	0.0-0.5	0.32	0.32			
	28-48	12-18	1.40-1.65	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.28	0.28			
	48-80	7-18	1.50-1.65	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.28	0.28			
Lida----------	0-9	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3	86
	9-19	3-15	1.40-1.60	2.00-20.00	0.08-0.13	Low------	0.0-0.5	0.10	0.17			
	19-28	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24			
	28-60	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10			
705C:												
Nitche----------	0-15	8-18	1.45-1.65	2.00-6.00	0.13-0.19	Low------	3.0-5.0	0.20	0.20	4	3	86
	15-23	8-18	1.45-1.65	0.60-6.00	0.12-0.19	Low------	0.5-1.0	0.17	0.24			
	23-41	5-10	1.55-1.65	6.00-20.00	0.06-0.10	Low------	0.0-0.5	0.10	0.17			
	41-60	10-18	1.65-1.80	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.24	0.24			
Kandota---------	0-7	10-20	1.35-1.60	0.60-6.00	0.14-0.17	Low------	2.0-4.0	0.20	0.20	5	3	86
	7-13	5-18	1.35-1.65	0.60-6.00	0.11-0.17	Low------	0.5-1.0	0.24	0.24			
	13-33	18-30	1.50-1.75	0.60-2.00	0.16-0.19	Low------	0.0-0.5	0.32	0.32			
	33-47	12-18	1.40-1.65	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.28	0.28			
	47-60	7-18	1.50-1.65	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.28	0.28			
Lida----------	0-6	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3	86
	6-17	3-15	1.40-1.60	2.00-20.00	0.08-0.13	Low------	0.0-0.5	0.10	0.17			
	17-28	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24			
	28-60	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10			
707B:												
Lizzie----------	0-9	18-22	1.20-1.40	0.60-2.00	0.20-0.24	Moderate	2.0-5.0	0.28	0.28	5	5	56
	9-26	18-35	1.20-1.40	0.60-2.00	0.15-0.22	Moderate	0.0-0.5	0.37	0.37			
	26-32	8-20	1.20-1.40	0.60-2.00	0.15-0.22	Low------	0.0-0.5	0.32	0.32			
	32-60	3-16	1.30-1.65	0.60-6.00	0.08-0.22	Low------	0.0-0.5	0.32	0.32			
707C2:												
Lizzie----------	0-10	18-22	1.20-1.40	0.60-2.00	0.20-0.24	Moderate	2.0-5.0	0.28	0.28	5	5	56
	10-35	18-35	1.20-1.40	0.60-2.00	0.15-0.22	Moderate	0.0-0.5	0.37	0.37			
	35-40	8-20	1.20-1.40	0.60-2.00	0.15-0.22	Low------	0.0-0.5	0.32	0.32			
	40-80	3-16	1.30-1.65	0.60-6.00	0.08-0.22	Low------	0.0-0.5	0.32	0.32			
707D2:												
Lizzie----------	0-8	18-22	1.20-1.40	0.60-2.00	0.20-0.24	Moderate	2.0-5.0	0.28	0.28	5	5	56
	8-21	18-35	1.20-1.40	0.60-2.00	0.15-0.22	Moderate	0.0-0.5	0.37	0.37			
	21-35	8-20	1.20-1.40	0.60-2.00	0.15-0.22	Low------	0.0-0.5	0.32	0.32			
	35-60	3-16	1.30-1.65	0.60-6.00	0.08-0.22	Low------	0.0-0.5	0.32	0.32			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
710:												
Friberg---------	0-19	10-24	1.30-1.60	0.60-2.00	0.20-0.24	Low------	5.0-7.0	0.28	0.28	5	5	56
	19-47	22-35	1.30-1.65	0.60-2.00	0.15-0.19	Moderate	0.5-2.0	0.32	0.32			
	47-60	10-22	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.32	0.32			
Weetown---------	0-9	10-20	1.35-1.65	0.60-2.00	0.13-0.18	Low------	4.0-12	0.20	0.20	5	3	86
	9-31	10-22	1.40-1.65	0.60-2.00	0.13-0.18	Low------	2.0-8.0	0.28	0.28			
	31-51	18-28	1.30-1.60	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.32	0.32			
	51-60	10-18	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.32	0.32			
711B:												
Arvilla---------	0-13	6-18	1.40-1.60	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.20	0.20	3	3	86
	13-19	6-18	1.40-1.60	2.00-6.00	0.11-0.14	Low------	1.0-2.0	0.20	0.20			
	19-60	2-10	1.40-1.60	6.00-20.00	0.02-0.05	Low------	0.0-0.5	0.10	0.20			
Sandberg--------	0-12	5-15	1.35-1.55	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.17	0.17	3	3	86
	12-20	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.5-1.0	0.05	0.10			
	20-32	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.5-1.0	0.05	0.10			
	32-60	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.0-0.5	0.05	0.10			
711C:												
Arvilla---------	0-8	6-18	1.40-1.60	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.20	0.20	3	3	86
	8-15	6-18	1.40-1.60	2.00-6.00	0.11-0.14	Low------	1.0-2.0	0.20	0.20			
	15-60	2-10	1.40-1.60	6.00-20.00	0.02-0.05	Low------	0.0-0.5	0.10	0.20			
Sandberg--------	0-7	5-15	1.35-1.55	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.17	0.17	3	3	86
	7-14	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.5-1.0	0.05	0.10			
	14-60	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.0-0.5	0.05	0.10			
715:												
Bluffcreek------	0-8	5-14	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-5.0	0.20	0.20	5	3	86
	8-26	3-10	1.45-1.65	6.00-20.00	0.08-0.10	Low------	0.0-0.5	0.15	0.15			
	26-42	8-18	1.45-1.65	2.00-6.00	0.10-0.14	Low------	0.0-0.5	0.15	0.20			
	42-80	1-5	1.60-1.70	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.10	0.15			
Clearriver------	0-9	5-15	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-2.0	0.17	0.17	5	2	134
	9-48	3-10	1.55-1.70	6.00-20.00	0.06-0.11	Low------	0.0-0.5	0.15	0.15			
	48-60	1-5	1.55-1.70	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			
716B:												
Leaflake--------	0-8	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-4.0	0.17	0.17	5	2	134
	8-26	2-10	1.40-1.70	6.00-20.00	0.06-0.09	Low------	0.0-0.5	0.15	0.15			
	26-51	15-28	1.50-1.70	0.60-2.00	0.12-0.18	Low------	0.0-0.5	0.28	0.32			
	51-60	10-18	1.60-1.80	0.60-2.00	0.11-0.17	Low------	0.0-0.5	0.24	0.28			
Eagleview-------	0-9	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2	134
	9-36	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17			
	36-54	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15			
	54-60	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15			
716C:												
Leaflake--------	0-3	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-4.0	0.17	0.17	5	2	134
	3-34	2-10	1.40-1.70	6.00-20.00	0.06-0.09	Low------	0.0-0.5	0.15	0.15			
	34-71	15-28	1.50-1.70	0.60-2.00	0.12-0.18	Low------	0.0-0.5	0.28	0.32			
	71-80	10-18	1.60-1.80	0.60-2.00	0.11-0.17	Low------	0.0-0.5	0.24	0.28			
Eagleview-------	0-3	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2	134
	3-46	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17			
	46-78	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15			
	78-80	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
716D:												
Leaflake--------	0-6	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-4.0	0.17	0.17	5	2	134
	6-23	2-10	1.40-1.70	6.00-20.00	0.06-0.09	Low------	0.0-0.5	0.15	0.15			
	23-39	15-28	1.50-1.70	0.60-2.00	0.12-0.18	Low------	0.0-0.5	0.28	0.32			
	39-60	10-18	1.60-1.80	0.60-2.00	0.11-0.17	Low------	0.0-0.5	0.24	0.28			
Eagleview-------	0-3	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2	134
	3-42	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17			
	42-60	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15			
718E:												
Naytahwaush-----	0-5	10-20	1.30-1.55	0.60-2.00	0.20-0.24	Moderate	3.0-6.0	0.28	0.28	5	6	48
	5-10	8-15	1.30-1.50	0.20-2.00	0.16-0.24	Moderate	0.5-1.0	0.28	0.28			
	10-31	35-60	1.25-1.40	0.06-0.20	0.10-0.19	High-----	0.5-1.0	0.32	0.32			
	31-60	22-35	1.30-1.55	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			
721B:												
Corliss---------	0-8	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2	134
	8-19	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.0-0.5	0.10	0.15			
	19-60	0-5	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			
721C:												
Corliss---------	0-7	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2	134
	7-28	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.0-0.5	0.10	0.15			
	28-80	0-5	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			
721D:												
Corliss---------	0-6	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2	134
	6-20	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.0-0.5	0.10	0.15			
	20-60	0-5	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			
721E:												
Corliss---------	0-2	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2	134
	2-22	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.0-0.5	0.10	0.15			
	22-60	0-5	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			
726:												
Kratka----------	0-8	5-15	1.20-1.50	2.00-6.00	0.13-0.18	Low------	2.0-5.0	0.17	0.17	3	3	86
	8-33	2-10	1.30-1.60	6.00-20.00	0.06-0.11	Low------	0.5-1.0	0.17	0.17			
	33-60	10-35	1.50-1.80	0.20-2.00	0.11-0.19	Moderate	0.0-0.5	0.32	0.32			
746:												
Haslie----------	0-21	---	0.10-0.30	0.60-6.00	0.35-0.48	---------	60-90	---	---	1	2	134
	21-24	---	0.10-0.30	0.60-6.00	0.35-0.48	---------	60-90	---	---			
	24-60	18-35	0.10-0.50	0.06-0.60	0.18-0.24	Moderate	6.0-20	0.28	0.28			
760C2:												
Chapett---------	0-7	10-20	1.30-1.60	0.60-2.00	0.20-0.22	Low------	2.0-4.0	0.24	0.24	5	5	56
	7-19	18-28	1.30-1.65	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.32	0.32			
	19-27	10-18	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
	27-60	10-18	1.65-1.80	0.60-2.00	0.10-0.16	Low------	0.0-0.5	0.28	0.28			
Sisseton--------	0-7	15-20	1.20-1.30	0.60-2.00	0.16-0.18	Low------	1.0-3.0	0.32	0.32	5	4L	86
	7-22	10-18	1.20-1.35	0.60-2.00	0.16-0.20	Low------	0.0-1.0	0.32	0.32			
	22-60	10-18	1.30-1.50	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.37	0.37			
760D2:												
Chapett---------	0-7	10-20	1.30-1.60	0.60-2.00	0.20-0.22	Low------	2.0-4.0	0.24	0.24	5	5	56
	7-15	18-28	1.30-1.65	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.32	0.32			
	15-23	10-18	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
	23-60	10-18	1.65-1.80	0.60-2.00	0.10-0.16	Low------	0.0-0.5	0.28	0.28			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Kf	T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
760D2:												
Sisseton--------	0-8	15-20	1.20-1.30	0.60-2.00	0.16-0.18	Low------	1.0-3.0	0.32	0.32	5	4L	86
	8-16	10-18	1.20-1.35	0.60-2.00	0.16-0.20	Low------	0.0-1.0	0.32	0.32			
	16-60	10-18	1.30-1.50	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.37	0.37			
769B:												
Mehurin---------	0-13	27-35	1.25-1.35	0.20-0.60	0.17-0.19	Moderate	4.0-8.0	0.24	0.24	5	6	48
	13-26	35-60	1.25-1.40	0.06-0.60	0.10-0.19	High-----	1.0-2.0	0.32	0.32			
	26-34	20-35	1.20-1.60	0.20-2.00	0.15-0.19	Moderate	0.0-0.5	0.37	0.37			
	34-60	20-30	1.20-1.60	0.20-2.00	0.15-0.19	Moderate	0.0-0.5	0.37	0.37			
776B:												
Snellman--------	0-3	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3	86
	3-12	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28			
	12-32	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28			
	32-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
Sugarbush-------	0-3	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3	86
	3-17	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17			
	17-28	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24			
	28-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			
776C:												
Snellman--------	0-2	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3	86
	2-16	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28			
	16-32	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28			
	32-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
Sugarbush-------	0-2	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3	86
	2-14	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17			
	14-21	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24			
	21-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			
776E:												
Snellman--------	0-3	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3	86
	3-14	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28			
	14-26	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28			
	26-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
Sugarbush-------	0-2	5-15	1.30-1.50	2.00-6.00	0.13-0.15	Low------	1.0-2.0	0.20	0.20	4	3	86
	2-10	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17			
	10-19	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low------	0.0-0.5	0.24	0.24			
	19-60	1-5	1.60-1.80	20.00-40.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			
777C2:												
Sisseton--------	0-9	15-20	1.20-1.30	0.60-2.00	0.16-0.18	Low------	1.0-3.0	0.32	0.32	5	4L	86
	9-19	10-18	1.20-1.35	0.60-2.00	0.16-0.20	Low------	0.0-1.0	0.32	0.32			
	19-60	10-18	1.30-1.50	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.37	0.37			
Heimdal---------	0-7	10-20	1.30-1.60	0.60-2.00	0.20-0.22	Low------	3.0-6.0	0.24	0.24	5	5	56
	7-17	10-18	1.35-1.65	0.60-2.00	0.12-0.19	Low------	0.5-1.0	0.32	0.32			
	17-34	10-18	1.45-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.32	0.32			
	34-60	7-18	1.65-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.32	0.32			
777D2:												
Sisseton--------	0-8	15-20	1.20-1.30	0.60-2.00	0.16-0.18	Low------	1.0-3.0	0.32	0.32	5	4L	86
	8-16	10-18	1.20-1.35	0.60-2.00	0.16-0.20	Low------	0.0-1.0	0.32	0.32			
	16-60	10-18	1.30-1.50	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.37	0.37			
Heimdal---------	0-8	10-20	1.30-1.60	0.60-2.00	0.20-0.22	Low------	3.0-6.0	0.24	0.24	5	5	56
	8-12	10-18	1.35-1.65	0.60-2.00	0.12-0.19	Low------	0.5-1.0	0.32	0.32			
	12-25	10-18	1.45-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.32	0.32			
	25-60	7-18	1.65-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.32	0.32			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
777E:												
Sisseton--------	0-3	15-20	1.20-1.30	0.60-2.00	0.16-0.18	Low------	1.0-3.0	0.32	0.32	5	4L	86
	3-12	10-18	1.20-1.35	0.60-2.00	0.16-0.20	Low------	0.0-1.0	0.32	0.32			
	12-60	10-18	1.30-1.50	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.37	0.37			
Heimdal---------	0-8	10-20	1.30-1.60	0.60-2.00	0.20-0.22	Low------	3.0-6.0	0.24	0.24	5	5	56
	8-12	10-18	1.35-1.65	0.60-2.00	0.12-0.19	Low------	0.5-1.0	0.32	0.32			
	12-19	10-18	1.45-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.32	0.32			
	19-60	7-18	1.65-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.32	0.32			
778B:												
Dorset----------	0-10	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3	86
	10-20	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28			
	20-38	5-10	1.55-1.65	6.00-20.00	0.06-0.10	Low------	0.0-0.5	0.10	0.17			
	38-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15			
Corliss---------	0-7	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2	134
	7-16	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.0-0.5	0.10	0.15			
	16-60	0-5	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			
778C:												
Dorset----------	0-9	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3	86
	9-16	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28			
	16-43	5-10	1.55-1.65	6.00-20.00	0.06-0.10	Low------	0.0-0.5	0.10	0.17			
	43-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15			
Corliss---------	0-7	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2	134
	7-11	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.0-0.5	0.10	0.15			
	11-60	0-5	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			
779B:												
Peever----------	0-11	27-35	1.25-1.35	0.20-0.60	0.19-0.22	Moderate	3.0-6.0	0.24	0.24	5	6	48
	11-29	35-50	1.25-1.40	0.06-0.60	0.11-0.19	High-----	1.0-4.0	0.37	0.37			
	29-60	30-45	1.50-1.70	0.06-0.60	0.08-0.17	High-----	0.0-0.5	0.37	0.37			
Mehurin---------	0-13	27-35	1.25-1.35	0.20-0.60	0.17-0.19	Moderate	4.0-8.0	0.24	0.24	5	6	48
	13-35	35-60	1.25-1.40	0.06-0.60	0.10-0.19	High-----	1.0-2.0	0.32	0.32			
	35-48	20-35	1.20-1.60	0.20-2.00	0.15-0.19	Moderate	0.0-0.5	0.37	0.37			
	48-60	20-30	1.20-1.60	0.20-2.00	0.15-0.19	Moderate	0.0-0.5	0.37	0.37			
902B:												
Barnes----------	0-9	18-27	1.40-1.50	0.60-2.00	0.18-0.24	Low------	2.0-5.0	0.28	0.32	5	6	48
	9-17	18-27	1.50-1.60	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.28	0.32			
	17-60	18-27	1.50-1.60	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.37	0.43			
Buse----------	0-8	18-27	1.40-1.50	0.60-2.00	0.17-0.22	Low------	1.0-3.0	0.28	0.28	5	4L	86
	8-40	18-27	1.50-1.60	0.60-2.00	0.14-0.19	Low------	0.5-1.0	0.37	0.37			
	40-60	18-27	1.50-1.60	0.60-2.00	0.14-0.19	Low------	0.5-1.0	0.37	0.37			
903C2:												
Barnes----------	0-10	18-27	1.40-1.50	0.60-2.00	0.18-0.24	Low------	2.0-5.0	0.28	0.32	5	6	48
	10-16	18-27	1.50-1.60	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.28	0.32			
	16-60	18-27	1.50-1.60	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.37	0.43			
Langhei---------	0-7	18-27	1.40-1.50	0.60-2.00	0.17-0.22	Low------	0.5-3.0	0.32	0.32	5	4L	86
	7-30	18-32	1.50-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32			
	30-60	18-32	1.50-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32			
915C2:												
Forman----------	0-8	27-30	1.20-1.40	0.60-2.00	0.17-0.19	Moderate	4.0-8.0	0.24	0.28	5	6	48
	8-23	30-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.28	0.32			
	23-60	18-35	1.30-1.50	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.43			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
915C2:												
Buse----------	0-7	18-27	1.40-1.50	0.60-2.00	0.17-0.22	Low------	1.0-3.0	0.28	0.28	5	4L	86
	7-30	18-27	1.50-1.60	0.60-2.00	0.14-0.19	Low------	0.5-1.0	0.37	0.37			
	30-60	18-27	1.50-1.60	0.60-2.00	0.14-0.19	Low------	0.5-1.0	0.37	0.37			
915D2:												
Forman----------	0-9	27-30	1.20-1.40	0.60-2.00	0.17-0.19	Moderate	4.0-8.0	0.24	0.28	5	6	48
	9-23	30-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.28	0.32			
	23-60	18-35	1.30-1.50	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.43			
Buse----------	0-9	18-27	1.40-1.50	0.60-2.00	0.17-0.22	Low------	1.0-3.0	0.28	0.28	5	4L	86
	9-16	18-27	1.50-1.60	0.60-2.00	0.14-0.19	Low------	0.5-1.0	0.37	0.37			
	16-60	18-27	1.50-1.60	0.60-2.00	0.14-0.19	Low------	0.5-1.0	0.37	0.37			
931C2:												
Formdale--------	0-8	27-35	1.30-1.50	0.60-2.00	0.17-0.19	Moderate	2.0-5.0	0.24	0.24	5	6	48
	8-18	24-35	1.40-1.60	0.20-0.60	0.17-0.19	Moderate	0.5-2.0	0.37	0.37			
	18-39	18-35	1.50-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			
	39-60	18-35	1.50-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			
Langhei---------	0-7	28-35	1.40-1.50	0.20-0.60	0.17-0.22	Low------	0.5-3.0	0.28	0.32	5	4L	86
	7-16	28-35	1.50-1.65	0.20-0.60	0.14-0.19	Low------	0.0-0.5	0.32	0.37			
	16-60	28-35	1.50-1.65	0.20-0.60	0.14-0.19	Low------	0.0-0.5	0.32	0.37			
931D2:												
Formdale--------	0-8	27-35	1.30-1.50	0.60-2.00	0.17-0.19	Moderate	2.0-5.0	0.24	0.24	5	6	48
	8-12	24-35	1.40-1.60	0.20-0.60	0.17-0.19	Moderate	0.5-2.0	0.37	0.37			
	12-26	18-35	1.50-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			
	26-60	18-35	1.50-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			
Langhei---------	0-5	28-35	1.40-1.50	0.20-0.60	0.17-0.22	Low------	0.5-3.0	0.28	0.32	5	4L	86
	5-21	28-35	1.50-1.65	0.20-0.60	0.14-0.19	Low------	0.0-0.5	0.32	0.37			
	21-60	28-35	1.50-1.65	0.20-0.60	0.14-0.19	Low------	0.0-0.5	0.32	0.37			
942D2:												
Langhei---------	0-7	18-27	1.40-1.50	0.60-2.00	0.17-0.22	Low------	0.5-3.0	0.32	0.32	5	4L	86
	7-13	18-32	1.50-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32			
	13-60	18-32	1.50-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32			
Barnes----------	0-7	18-27	1.40-1.50	0.60-2.00	0.18-0.24	Low------	2.0-5.0	0.28	0.32	5	6	48
	7-14	18-27	1.50-1.60	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.28	0.32			
	14-60	18-27	1.50-1.60	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.37	0.43			
957B2:												
Rothsay---------	0-15	10-18	1.20-1.40	0.60-2.00	0.22-0.24	Low------	3.0-6.0	0.32	0.32	5	5	56
	15-27	10-18	1.20-1.40	0.60-2.00	0.17-0.22	Low------	0.5-1.0	0.43	0.43			
	27-33	5-18	1.20-1.40	0.60-6.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
	33-60	5-18	1.20-1.40	0.60-6.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
Zell----------	0-9	10-18	1.15-1.30	0.60-2.00	0.19-0.22	Low------	2.0-5.0	0.32	0.32	5	4L	86
	9-18	10-18	1.25-1.40	0.60-2.00	0.15-0.20	Low------	0.0-1.0	0.43	0.43			
	18-60	5-18	1.25-1.40	0.60-2.00	0.15-0.20	Low------	0.0-0.5	0.43	0.43			
969C2:												
Zell----------	0-8	10-18	1.15-1.30	0.60-2.00	0.19-0.22	Low------	2.0-5.0	0.32	0.32	5	4L	86
	8-31	10-18	1.25-1.40	0.60-2.00	0.15-0.20	Low------	0.0-1.0	0.43	0.43			
	31-60	5-18	1.25-1.40	0.60-2.00	0.15-0.20	Low------	0.0-0.5	0.43	0.43			
Rothsay---------	0-9	10-18	1.20-1.40	0.60-2.00	0.22-0.24	Low------	3.0-6.0	0.32	0.32	5	5	56
	9-17	10-18	1.20-1.40	0.60-2.00	0.17-0.22	Low------	0.5-1.0	0.43	0.43			
	17-28	5-18	1.20-1.40	0.60-6.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
	28-60	5-18	1.20-1.40	0.60-6.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
969D2:												
Zell----------	0-8	10-18	1.15-1.30	0.60-2.00	0.19-0.22	Low------	2.0-5.0	0.32	0.32	5	4L	86
	8-13	10-18	1.25-1.40	0.60-2.00	0.15-0.20	Low------	0.0-1.0	0.43	0.43			
	13-60	5-18	1.25-1.40	0.60-2.00	0.15-0.20	Low------	0.0-0.5	0.43	0.43			
Rothsay---------	0-6	10-18	1.20-1.40	0.60-2.00	0.22-0.24	Low------	3.0-6.0	0.32	0.32	5	5	56
	6-12	10-18	1.20-1.40	0.60-2.00	0.17-0.22	Low------	0.5-1.0	0.43	0.43			
	12-32	5-18	1.20-1.40	0.60-6.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
	32-60	5-18	1.20-1.40	0.60-6.00	0.20-0.22	Low------	0.0-0.5	0.43	0.43			
1015:												
Udipsamments----	0-14	1-15	1.50-1.70	2.00-20.00	0.05-0.10	Low------	0.0-0.5	0.15	0.15	5	2	220
	14-60	1-10	1.50-1.70	6.00-20.00	0.05-0.08	Low------	---	0.10	0.10			
	60-80	1-10	1.50-1.70	>20.00	0.03-0.05	Low------	---	0.05	0.10			
1016:												
Udorthents------	0-60	---	---	---	---	---------	---	---	---	---	---	---
	60-80	---	---	0.06-6.00	---	---------	---	---	---			
1027:												
Udorthents.												
1030:												
Pits.												
Udipsamments----	0-14	1-15	1.50-1.70	2.00-20.00	0.05-0.10	Low------	0.0-0.5	0.15	0.15	5	2	220
	14-60	1-10	1.50-1.70	6.00-20.00	0.05-0.08	Low------	---	0.10	0.10			
	60-80	1-10	1.50-1.70	>20.00	0.03-0.05	Low------	---	0.05	0.10			
1077:												
Forada----------	0-16	10-22	1.00-1.40	0.60-2.00	0.20-0.22	Low------	5.0-15	0.28	0.28	4	5	56
	16-27	8-18	1.30-1.50	2.00-6.00	0.12-0.19	Low------	0.5-1.0	0.28	0.28			
	27-60	0-5	1.50-1.70	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.15	0.15			
Leafriver-------	0-12	---	0.10-0.25	0.60-6.00	0.35-0.50	---------	50-90	---	---	5	2	134
	12-20	3-18	1.40-1.65	2.00-20.00	0.08-0.14	Low------	5.0-20	0.17	0.17			
	20-60	0-10	1.50-1.65	6.00-20.00	0.03-0.08	Low------	0.5-5.0	0.17	0.17			
1102B:												
Chapett---------	0-10	10-20	1.30-1.60	0.60-2.00	0.20-0.22	Low------	2.0-4.0	0.24	0.24	5	5	56
	10-25	18-28	1.30-1.65	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.32	0.32			
	25-37	10-18	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
	37-60	10-18	1.65-1.80	0.60-2.00	0.10-0.16	Low------	0.0-0.5	0.28	0.28			
Dorset----------	0-12	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3	86
	12-15	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28			
	15-32	5-10	1.55-1.65	6.00-20.00	0.06-0.10	Low------	0.0-0.5	0.10	0.17			
	32-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15			
1102C:												
Chapett---------	0-9	10-20	1.30-1.60	0.60-2.00	0.20-0.22	Low------	2.0-4.0	0.24	0.24	5	5	56
	9-20	18-28	1.30-1.65	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.32	0.32			
	20-34	10-18	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
	34-60	10-18	1.65-1.80	0.60-2.00	0.10-0.16	Low------	0.0-0.5	0.28	0.28			
Dorset----------	0-10	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3	86
	10-18	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28			
	18-29	5-10	1.55-1.65	6.00-20.00	0.06-0.10	Low------	0.0-0.5	0.10	0.17			
	29-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1103:												
Clitherall------	0-10	8-15	1.45-1.60	2.00-6.00	0.13-0.18	Low------	2.0-6.0	0.20	0.20	4	3	86
	10-16	8-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	0.5-2.0	0.24	0.24			
	16-38	1-5	1.55-1.65	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.10	0.15			
	38-80	10-18	1.65-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.24	0.24			
1104B:												
Waukon----------	0-9	12-27	1.40-1.60	0.60-2.00	0.20-0.24	Moderate	2.0-6.0	0.24	0.24	5	6	48
	9-34	18-35	1.40-1.60	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.32	0.32			
	34-60	18-30	1.45-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32			
Dorset----------	0-9	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3	86
	9-23	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28			
	23-33	5-10	1.55-1.65	6.00-20.00	0.06-0.10	Low------	0.0-0.5	0.10	0.17			
	33-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15			
1104C:												
Waukon----------	0-9	12-27	1.40-1.60	0.60-2.00	0.20-0.24	Moderate	2.0-6.0	0.24	0.24	5	6	48
	9-28	18-35	1.40-1.60	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.32	0.32			
	28-60	18-30	1.45-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32			
Dorset----------	0-10	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3	86
	10-14	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28			
	14-20	5-10	1.55-1.65	6.00-20.00	0.06-0.10	Low------	0.0-0.5	0.10	0.17			
	20-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15			
1104D:												
Waukon----------	0-9	12-27	1.40-1.60	0.60-2.00	0.20-0.24	Moderate	2.0-6.0	0.24	0.24	5	6	48
	9-21	18-35	1.40-1.60	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.32	0.32			
	21-60	18-30	1.45-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32			
Dorset----------	0-8	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3	86
	8-18	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28			
	18-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15			
1105B:												
Dent----------	0-12	8-22	1.20-1.40	0.60-2.00	0.20-0.24	Low------	2.0-6.0	0.28	0.28	5	5	56
	12-26	18-35	1.20-1.40	0.60-2.00	0.17-0.22	Moderate	0.5-1.0	0.43	0.43			
	26-54	8-27	1.20-1.40	0.60-2.00	0.15-0.22	Low------	0.0-0.5	0.43	0.43			
	54-80	5-20	1.30-1.65	0.60-2.00	0.12-0.22	Low------	0.0-0.5	0.43	0.43			
1110:												
Isan----------	0-16	5-14	1.30-1.55	2.00-6.00	0.10-0.15	Low------	3.0-10	0.20	0.20	3	3	86
	16-26	2-8	1.50-1.65	6.00-20.00	0.06-0.10	Low------	0.5-3.0	0.17	0.17			
	26-60	1-5	1.55-1.70	6.00-20.00	0.04-0.06	Low------	0.0-0.5	0.15	0.15			
1111:												
Nidaros---------	0-32	---	0.15-0.45	0.20-6.00	0.35-0.45	---------	55-85	---	---	2	2	134
	32-38	8-35	1.50-1.80	0.60-2.00	0.13-0.22	Low------	5.0-15	0.20	0.24			
	38-60	0-4	1.40-1.65	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.15			
1112D:												
Chapett---------	0-8	10-20	1.30-1.60	0.60-2.00	0.20-0.22	Low------	2.0-4.0	0.24	0.24	5	5	56
	8-18	18-28	1.30-1.65	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.32	0.32			
	18-30	10-18	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
	30-60	10-18	1.65-1.80	0.60-2.00	0.10-0.16	Low------	0.0-0.5	0.28	0.28			
Corliss---------	0-6	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2	134
	6-18	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.0-0.5	0.10	0.15			
	18-60	0-5	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1112E:												
Chapett---------	0-7	10-20	1.30-1.60	0.60-2.00	0.20-0.22	Low------	2.0-4.0	0.24	0.24	5	5	56
	7-20	18-28	1.30-1.65	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.32	0.32			
	20-37	10-18	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
	37-60	10-18	1.65-1.80	0.60-2.00	0.10-0.16	Low------	0.0-0.5	0.28	0.28			
Corliss---------	0-7	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2	134
	7-10	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.0-0.5	0.10	0.15			
	10-60	0-5	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			
1113:												
Haslie----------	0-44	---	0.10-0.30	0.60-6.00	0.35-0.48	---------	60-90	---	---	1	8	---
	44-60	18-35	0.10-0.50	0.06-0.60	0.18-0.24	Moderate	6.0-20	0.28	0.28			
Seelyeville-----	0-30	---	0.10-0.25	0.20-6.00	0.35-0.45	---------	25-99	---	---	3	8	---
	30-60	---	0.10-0.25	0.20-6.00	0.35-0.45	---------	25-99	---	---			
Cathro----------	0-30	---	0.28-0.45	0.20-6.00	0.45-0.55	---------	60-85	---	---	2	8	---
	30-60	10-30	1.50-1.70	0.20-2.00	0.11-0.22	Low------	1.0-5.0	---	---			
1114:												
Hangaard--------	0-8	5-15	1.50-1.70	6.00-20.00	0.10-0.12	Low------	1.0-4.0	0.17	0.17	5	2	134
	8-60	2-10	1.50-1.70	6.00-40.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15			
1120:												
Rushlake--------	0-5	3-10	1.50-1.70	6.00-20.00	0.10-0.12	Low------	0.5-4.0	0.17	0.17	5	2	134
	5-60	1-10	1.50-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.05	0.10			
Hangaard--------	0-4	5-15	1.50-1.70	6.00-20.00	0.10-0.12	Low------	1.0-4.0	0.17	0.17	5	2	134
	4-60	2-10	1.50-1.70	6.00-40.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15			
1129:												
Lindaas---------	0-15	27-35	1.10-1.30	0.60-2.00	0.14-0.17	Moderate	4.0-7.0	0.28	0.28	5	7	38
	15-25	35-60	1.20-1.40	0.06-0.20	0.10-0.14	High-----	2.0-4.0	0.32	0.32			
	25-60	25-40	1.20-1.50	0.20-0.60	0.11-0.15	Moderate	0.5-1.0	0.32	0.32			
1131B:												
Verndale--------	0-9	7-12	1.50-1.70	2.00-6.00	0.13-0.17	Low------	2.0-4.0	0.20	0.20	3	3	86
	9-19	7-18	1.60-1.70	0.60-2.00	0.14-0.18	Low------	0.5-1.0	0.24	0.24			
	19-49	2-6	1.45-1.60	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.10	0.10			
	49-60	0-4	1.45-1.60	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.10			
Abbeylake-------	0-8	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2	134
	8-19	0-10	1.50-1.65	6.00-20.00	0.03-0.11	Low------	0.0-0.5	0.10	0.10			
	19-60	0-3	1.50-1.65	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.10			
1136:												
Nidaros---------	0-27	---	0.15-0.45	0.20-6.00	0.35-0.45	---------	55-85	---	---	2	2	134
	27-38	8-35	1.50-1.80	0.60-2.00	0.13-0.22	Low------	5.0-15	0.24	0.24			
	38-60	0-4	1.40-1.65	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.15			
1149:												
Hamerly---------	0-16	27-35	1.10-1.50	0.20-2.00	0.17-0.19	Moderate	4.0-7.0	0.24	0.24	5	4L	86
	16-25	18-35	1.20-1.50	0.20-2.00	0.15-0.19	Moderate	1.0-4.0	0.28	0.28			
	25-60	18-35	1.20-1.60	0.20-2.00	0.14-0.19	Moderate	0.0-1.0	0.37	0.37			
1195A:												
Sybil----------	0-6	3-10	1.35-1.65	6.00-20.00	0.07-0.12	Low------	1.0-4.0	0.17	0.17	5	2	134
	6-14	3-15	1.35-1.65	2.00-20.00	0.10-0.18	Low------	0.0-0.5	0.17	0.17			
	14-19	8-18	1.45-1.65	2.00-6.00	0.12-0.17	Low------	0.5-1.0	0.24	0.24			
	19-34	3-10	1.50-1.65	6.00-20.00	0.06-0.11	Low------	0.0-0.5	0.15	0.17			
	34-80	2-5	1.55-1.70	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.10	0.15			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Kf	T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1195A:												
Eagleview-------	0-8	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2	134
	8-32	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17			
	32-60	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15			
	60-80	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15			
1195B:												
Sybil----------	0-5	3-10	1.35-1.65	6.00-20.00	0.07-0.12	Low------	1.0-4.0	0.17	0.17	5	2	134
	5-10	3-15	1.35-1.65	2.00-20.00	0.10-0.18	Low------	0.0-0.5	0.17	0.17			
	10-15	8-18	1.45-1.65	2.00-6.00	0.12-0.17	Low------	0.5-1.0	0.24	0.24			
	15-32	3-10	1.50-1.65	6.00-20.00	0.06-0.11	Low------	0.0-0.5	0.15	0.17			
	32-80	2-5	1.55-1.70	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.10	0.15			
Eagleview-------	0-4	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2	134
	4-36	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17			
	36-60	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15			
1195C:												
Sybil----------	0-8	3-10	1.35-1.65	6.00-20.00	0.07-0.12	Low------	1.0-4.0	0.17	0.17	5	2	134
	8-17	3-15	1.35-1.65	2.00-20.00	0.10-0.18	Low------	0.0-0.5	0.17	0.17			
	17-26	8-18	1.45-1.65	2.00-6.00	0.12-0.17	Low------	0.5-1.0	0.24	0.24			
	26-37	3-10	1.50-1.65	6.00-20.00	0.06-0.11	Low------	0.0-0.5	0.15	0.17			
	37-80	2-5	1.55-1.70	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.10	0.15			
Eagleview-------	0-3	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2	134
	3-37	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17			
	37-60	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15			
	60-80	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15			
1195E:												
Sybil----------	0-4	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.20	0.20	5	3	86
	4-15	3-15	1.35-1.65	2.00-20.00	0.10-0.18	Low------	0.0-0.5	0.17	0.17			
	15-25	8-18	1.45-1.65	2.00-6.00	0.12-0.17	Low------	0.5-1.0	0.24	0.24			
	25-78	3-10	1.50-1.65	6.00-20.00	0.06-0.11	Low------	0.0-0.5	0.15	0.17			
	78-80	2-5	1.55-1.70	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.10	0.15			
Eagleview-------	0-7	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	0.5-2.0	0.17	0.17	5	2	134
	7-17	2-10	1.50-1.65	6.00-20.00	0.09-0.11	Low------	0.5-1.0	0.17	0.17			
	17-55	2-10	1.50-1.65	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.15	0.15			
	55-80	2-10	1.50-1.65	6.00-20.00	0.05-0.07	Low------	0.0-0.5	0.15	0.15			
1196B:												
Lida----------	0-9	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3	86
	9-13	3-15	1.40-1.60	2.00-20.00	0.08-0.13	Low------	0.0-0.5	0.10	0.17			
	13-25	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24			
	25-45	1-5	1.55-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.05	0.15			
	45-60	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10			
Two Inlets------	0-7	5-10	1.40-1.60	2.00-6.00	0.10-0.15	Low------	1.0-2.0	0.10	0.15	5	3	86
	7-14	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15			
	14-29	5-15	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15			
	29-60	0-3	1.60-1.80	20.00-40.00	0.02-0.04	Low------	0.0-0.5	0.05	0.10			
1196C:												
Lida----------	0-8	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3	86
	8-17	3-15	1.40-1.60	2.00-20.00	0.08-0.13	Low------	0.0-0.5	0.10	0.17			
	17-25	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24			
	25-41	1-5	1.55-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.05	0.15			
	41-80	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1196C:												
Two Inlets------	0-4	5-10	1.40-1.60	2.00-6.00	0.10-0.15	Low------	1.0-2.0	0.10	0.15	5	3	86
	4-9	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15			
	9-38	5-15	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15			
	38-60	0-3	1.60-1.80	20.00-40.00	0.02-0.04	Low------	0.0-0.5	0.05	0.10			
1196E:												
Lida----------	0-3	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3	86
	3-14	3-15	1.40-1.60	2.00-20.00	0.08-0.13	Low------	0.0-0.5	0.10	0.17			
	14-20	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24			
	20-27	1-5	1.55-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.05	0.15			
	27-60	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10			
Two Inlets------	0-3	5-10	1.40-1.60	2.00-6.00	0.10-0.15	Low------	1.0-2.0	0.10	0.15	5	3	86
	3-7	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15			
	7-21	5-15	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15			
	21-60	0-3	1.60-1.80	20.00-40.00	0.02-0.04	Low------	0.0-0.5	0.05	0.10			
1196F:												
Lida----------	0-4	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3	86
	4-17	3-15	1.40-1.60	2.00-20.00	0.08-0.13	Low------	0.0-0.5	0.10	0.17			
	17-25	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24			
	25-28	1-5	1.55-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.05	0.15			
	28-60	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10			
Two Inlets------	0-3	5-10	1.40-1.60	2.00-6.00	0.10-0.15	Low------	1.0-2.0	0.10	0.15	5	3	86
	3-7	2-10	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15			
	7-14	5-15	1.40-1.60	6.00-20.00	0.09-0.11	Low------	0.0-0.5	0.10	0.15			
	14-60	0-3	1.60-1.80	20.00-40.00	0.02-0.04	Low------	0.0-0.5	0.05	0.10			
1200:												
Egglake---------	0-4	8-15	1.35-1.60	0.60-6.00	0.10-0.21	Low------	2.0-4.0	0.28	0.28	5	5	56
	4-9	3-10	1.50-1.70	0.60-6.00	0.12-0.14	Low------	0.5-2.0	0.24	0.24			
	9-25	18-30	1.50-1.70	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.32	0.32			
	25-60	10-18	1.60-1.80	0.60-2.00	0.11-0.13	Low------	0.0-0.5	0.24	0.24			
1208B:												
Naytahwaush-----	0-7	27-35	1.30-1.55	0.20-0.60	0.17-0.20	Moderate	3.0-6.0	0.28	0.28	5	6	48
	7-25	35-60	1.25-1.40	0.06-0.20	0.10-0.19	High-----	0.5-1.0	0.32	0.32			
	25-60	22-35	1.30-1.55	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			
Mahkonce--------	0-7	22-35	1.30-1.55	0.20-0.60	0.17-0.22	Moderate	3.0-6.0	0.32	0.32	5	6	48
	7-37	35-60	1.25-1.40	0.06-0.20	0.13-0.19	High-----	0.0-0.5	0.24	0.24			
	37-55	30-45	1.30-1.55	0.20-0.60	0.13-0.19	Moderate	0.0-0.5	0.32	0.32			
	55-60	25-35	1.30-1.55	0.20-0.60	0.13-0.19	Moderate	0.0-0.5	0.32	0.32			
1209C:												
Naytahwaush-----	0-7	27-35	1.30-1.55	0.20-0.60	0.17-0.20	Moderate	3.0-6.0	0.28	0.28	5	6	48
	7-24	35-60	1.25-1.40	0.06-0.20	0.10-0.19	High-----	0.5-1.0	0.32	0.32			
	24-60	22-35	1.30-1.55	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			
1212B:												
Mahkonce--------	0-7	22-35	1.30-1.55	0.20-0.60	0.17-0.22	Moderate	3.0-6.0	0.32	0.32	5	6	48
	7-23	35-60	1.25-1.40	0.06-0.20	0.13-0.19	High-----	0.0-0.5	0.24	0.24			
	23-46	30-45	1.30-1.55	0.20-0.60	0.13-0.19	Moderate	0.0-0.5	0.32	0.32			
	46-60	25-35	1.30-1.55	0.20-0.60	0.13-0.19	Moderate	0.0-0.5	0.32	0.32			
1214:												
Mustinka--------	0-14	28-40	1.10-1.30	0.20-0.60	0.17-0.24	Moderate	5.0-10	0.28	0.28	5	7	38
	14-24	35-60	1.20-1.40	0.06-0.20	0.13-0.19	High-----	1.0-3.0	0.37	0.37			
	24-36	18-35	1.20-1.40	0.20-0.60	0.14-0.19	Moderate	0.5-1.0	0.37	0.37			
	36-80	18-35	1.40-1.60	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Kf	T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1215:												
Pinelake--------	0-12	8-15	1.30-1.50	2.00-6.00	0.13-0.18	Low------	4.0-8.0	0.20	0.20	4	3	86
	12-30	12-18	1.30-1.50	2.00-6.00	0.14-0.19	Low------	0.5-2.0	0.20	0.20			
	30-35	1-8	1.50-1.70	6.00-20.00	0.03-0.09	Low------	0.0-0.5	0.05	0.15			
	35-80	1-5	1.50-1.70	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.02	0.10			
1216B:												
Egglake---------	0-4	5-15	1.35-1.60	0.60-6.00	0.13-0.15	Low------	2.0-4.0	0.20	0.20	5	3	86
	4-8	3-10	1.50-1.70	0.60-6.00	0.12-0.14	Low------	0.5-2.0	0.24	0.24			
	8-22	18-30	1.50-1.70	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.32	0.32			
	22-60	10-18	1.60-1.80	0.60-2.00	0.11-0.13	Low------	0.0-0.5	0.24	0.24			
Wykeham---------	0-9	5-18	1.30-1.55	0.60-6.00	0.13-0.18	Low------	2.0-6.0	0.17	0.20	5	3	86
	9-13	5-15	1.50-1.70	0.60-2.00	0.10-0.17	Low------	1.0-2.0	0.24	0.28			
	13-40	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.5-1.0	0.24	0.28			
	40-60	10-18	1.55-1.75	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.24	0.28			
1217E:												
Waukon----------	0-8	12-27	1.40-1.60	0.60-2.00	0.20-0.24	Moderate	2.0-6.0	0.24	0.24	5	6	48
	8-36	18-35	1.40-1.60	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.32	0.32			
	36-60	18-30	1.45-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32			
Lida----------	0-6	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3	86
	6-16	3-15	1.40-1.60	2.00-20.00	0.08-0.13	Low------	0.0-0.5	0.10	0.17			
	16-36	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24			
	36-60	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10			
1218B:												
Snellman--------	0-3	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3	86
	3-10	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28			
	10-42	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28			
	42-55	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
	55-80	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
Lida----------	0-5	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3	86
	5-19	3-15	1.40-1.60	2.00-20.00	0.08-0.13	Low------	0.0-0.5	0.10	0.17			
	19-31	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24			
	31-35	1-5	1.55-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.05	0.15			
	35-80	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10			
1218C:												
Snellman--------	0-3	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3	86
	3-10	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28			
	10-39	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28			
	39-80	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
Lida----------	0-6	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3	86
	6-13	3-15	1.40-1.60	2.00-20.00	0.08-0.13	Low------	0.0-0.5	0.10	0.17			
	13-20	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24			
	20-80	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10			
1218E:												
Snellman--------	0-3	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3	86
	3-8	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28			
	8-30	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28			
	30-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
Lida----------	0-6	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3	86
	6-13	3-15	1.40-1.60	2.00-20.00	0.08-0.13	Low------	0.0-0.5	0.10	0.17			
	13-28	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24			
	28-42	1-5	1.55-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.05	0.15			
	42-60	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1218F:												
Snellman--------	0-3	5-18	1.35-1.60	0.60-6.00	0.13-0.18	Low------	1.0-3.0	0.20	0.20	5	3	86
	3-13	5-15	1.50-1.70	0.60-2.00	0.09-0.14	Low------	0.5-2.0	0.28	0.28			
	13-23	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.28	0.28			
	23-40	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
	40-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.28	0.28			
Lida----------	0-4	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3	86
	4-14	3-15	1.40-1.60	2.00-20.00	0.08-0.13	Low------	0.0-0.5	0.10	0.17			
	14-24	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24			
	24-35	1-5	1.55-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.05	0.15			
	35-60	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10			
1219C:												
Sandberg--------	0-8	5-15	1.35-1.55	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.17	0.17	3	3	86
	8-25	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.5-1.0	0.05	0.10			
	25-36	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.5-1.0	0.05	0.10			
	36-60	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.0-0.5	0.05	0.10			
Sverdrup--------	0-12	10-18	1.35-1.50	2.00-6.00	0.13-0.15	Low------	2.0-4.0	0.20	0.20	4	3	86
	12-24	6-18	1.40-1.55	2.00-6.00	0.08-0.14	Low------	0.5-2.0	0.20	0.20			
	24-60	0-10	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.15	0.15			
1221B:												
Sverdrup--------	0-15	10-18	1.35-1.50	2.00-6.00	0.13-0.15	Low------	2.0-4.0	0.20	0.20	4	3	86
	15-28	6-18	1.40-1.55	2.00-6.00	0.08-0.14	Low------	0.5-2.0	0.20	0.20			
	28-60	0-10	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.15	0.15			
Sandberg--------	0-8	5-15	1.35-1.55	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.17	0.17	3	3	86
	8-14	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.5-1.0	0.05	0.10			
	14-24	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.5-1.0	0.05	0.10			
	24-60	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.0-0.5	0.05	0.10			
1223D:												
Sandberg--------	0-7	5-15	1.35-1.55	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.17	0.17	3	3	86
	7-13	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.5-1.0	0.05	0.10			
	13-60	0-5	1.50-1.65	>20.00	0.02-0.06	Low------	0.0-0.5	0.05	0.10			
Arvilla---------	0-10	6-18	1.40-1.60	2.00-6.00	0.13-0.15	Low------	1.0-4.0	0.20	0.20	3	3	86
	10-19	6-18	1.40-1.60	2.00-6.00	0.11-0.14	Low------	1.0-2.0	0.20	0.20			
	19-60	2-10	1.40-1.60	6.00-20.00	0.02-0.05	Low------	0.0-0.5	0.10	0.20			
1227:												
Quam----------	0-33	22-27	1.00-1.40	0.60-2.00	0.22-0.24	Low------	6.0-15	0.28	0.28	5	6	48
	33-50	22-35	1.25-1.45	0.20-0.60	0.16-0.22	Moderate	4.0-10	0.28	0.28			
	50-60	20-35	1.40-1.65	0.20-0.60	0.14-0.19	Moderate	1.0-3.0	0.37	0.37			
Cathro----------	0-12	---	0.28-0.45	0.20-6.00	0.45-0.55	---------	60-85	---	---	2	8	---
	12-24	---	0.15-0.30	0.20-6.00	0.35-0.45	---------	60-85	---	---			
	24-60	10-30	1.50-1.70	0.20-2.00	0.11-0.22	Low------	1.0-5.0	---	---			
Urness----------	0-20	18-27	0.25-0.50	0.20-2.00	0.18-0.24	Moderate	10-50	0.28	0.28	5	8	---
	20-45	18-35	0.30-1.00	0.20-2.00	0.16-0.22	Moderate	10-50	0.28	0.28			
	45-60	18-35	1.00-1.65	0.20-2.00	0.14-0.20	Moderate	10-50	0.28	0.28			
1230:												
Haslie----------	0-44	---	0.10-0.30	0.60-6.00	0.35-0.48	---------	60-90	---	---	1	8	---
	44-60	18-35	0.10-0.50	0.06-0.60	0.18-0.24	Moderate	6.0-20	0.28	0.28			
Nidaros---------	0-38	---	0.15-0.45	0.20-6.00	0.35-0.45	---------	55-85	---	---	2	8	---
	38-54	8-35	1.50-1.80	0.60-2.00	0.13-0.22	Low------	5.0-15	0.20	0.24			
	54-60	0-4	1.40-1.65	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.15			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Kf	T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1232B:												
Chapett---------	0-8	10-20	1.30-1.60	0.60-2.00	0.20-0.22	Low------	2.0-4.0	0.24	0.24	5	5	56
	8-21	18-28	1.30-1.65	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.32	0.32			
	21-36	10-18	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
	36-60	10-18	1.65-1.80	0.60-2.00	0.10-0.16	Low------	0.0-0.5	0.28	0.28			
1232E:												
Chapett---------	0-9	10-20	1.30-1.60	0.60-2.00	0.20-0.22	Low------	2.0-4.0	0.24	0.24	5	5	56
	9-26	18-28	1.30-1.65	0.60-2.00	0.15-0.19	Low------	0.5-1.0	0.32	0.32			
	26-33	10-18	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
	33-60	10-18	1.65-1.80	0.60-2.00	0.10-0.16	Low------	0.0-0.5	0.28	0.28			
1234B:												
Formdale--------	0-11	27-35	1.30-1.50	0.60-2.00	0.17-0.19	Moderate	2.0-5.0	0.24	0.24	5	6	48
	11-18	24-35	1.40-1.60	0.20-0.60	0.17-0.19	Moderate	0.5-2.0	0.37	0.37			
	18-30	18-35	1.50-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			
	30-60	18-35	1.50-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			
Buse----------	0-8	27-35	1.40-1.50	0.20-0.60	0.17-0.22	Moderate	1.0-3.0	0.28	0.28	5	4L	86
	8-27	18-35	1.55-1.65	0.20-0.60	0.14-0.19	Moderate	0.5-1.0	0.37	0.37			
	27-60	18-35	1.55-1.65	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			
1237:												
Lakepark--------	0-9	20-27	1.30-1.45	0.20-0.60	0.19-0.21	Low------	5.0-8.0	0.24	0.24	5	6	48
	9-35	20-35	1.30-1.45	0.20-0.60	0.19-0.21	Low------	2.0-5.0	0.24	0.24			
	35-44	22-35	1.40-1.50	0.20-0.60	0.15-0.19	Moderate	0.5-2.0	0.32	0.32			
	44-60	22-35	1.50-1.70	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.32	0.32			
1239:												
Quam----------	0-9	22-27	1.00-1.40	0.60-2.00	0.22-0.24	Low------	6.0-15	0.28	0.28	5	6	48
	9-56	22-35	1.25-1.45	0.20-0.60	0.16-0.22	Moderate	4.0-10	0.28	0.28			
	56-80	20-35	1.40-1.65	0.20-0.60	0.14-0.19	Moderate	1.0-3.0	0.37	0.37			
1240:												
Roliss----------	0-14	28-35	1.10-1.40	0.20-0.60	0.18-0.22	Moderate	3.0-7.0	0.24	0.28	5	4L	86
	14-17	18-35	1.30-1.70	0.20-2.00	0.15-0.19	Moderate	1.0-3.0	0.28	0.28			
	17-27	18-35	1.30-1.70	0.20-2.00	0.15-0.19	Moderate	0.5-1.0	0.28	0.28			
	27-60	18-35	1.30-1.70	0.20-2.00	0.15-0.19	Moderate	0.5-1.0	0.28	0.28			
1247D:												
Corliss---------	0-7	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2	134
	7-10	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.0-0.5	0.10	0.15			
	10-60	0-5	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			
Dorset----------	0-8	4-18	1.40-1.55	2.00-6.00	0.13-0.15	Low------	3.0-5.0	0.20	0.20	4	3	86
	8-17	10-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28			
	17-22	5-10	1.55-1.65	6.00-20.00	0.06-0.10	Low------	0.0-0.5	0.10	0.17			
	22-60	0-5	1.55-1.65	6.00-20.00	0.02-0.04	Low------	0.0-0.5	0.10	0.15			
1250C:												
Abbeylake-------	0-8	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2	134
	8-18	0-10	1.50-1.65	6.00-20.00	0.03-0.11	Low------	0.0-0.5	0.10	0.10			
	18-60	0-3	1.50-1.65	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.10			
Verndale--------	0-9	7-12	1.50-1.70	2.00-6.00	0.13-0.17	Low------	2.0-4.0	0.20	0.20	3	3	86
	9-17	7-18	1.60-1.70	0.60-2.00	0.14-0.18	Low------	0.5-1.0	0.24	0.24			
	17-24	2-6	1.45-1.60	6.00-20.00	0.06-0.08	Low------	0.0-0.5	0.10	0.10			
	24-60	0-4	1.45-1.60	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.10			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1259:												
Hamerly---------	0-8	27-35	1.10-1.50	0.20-2.00	0.17-0.19	Moderate	4.0-7.0	0.24	0.24	5	4L	86
	8-40	18-35	1.20-1.50	0.20-2.00	0.15-0.19	Moderate	1.0-4.0	0.28	0.28			
	40-60	18-35	1.20-1.60	0.20-2.00	0.14-0.19	Moderate	0.0-1.0	0.37	0.37			
Mustinka--------	0-8	28-40	1.10-1.30	0.20-0.60	0.17-0.24	Moderate	5.0-10	0.28	0.28	5	7	38
	8-25	35-60	1.20-1.40	0.06-0.20	0.13-0.19	High-----	1.0-3.0	0.37	0.37			
	25-36	18-35	1.20-1.40	0.20-0.60	0.14-0.19	Moderate	0.5-1.0	0.37	0.37			
	36-60	18-35	1.40-1.60	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.37	0.37			
1275B:												
Kandota---------	0-9	10-20	1.35-1.60	0.60-6.00	0.14-0.17	Low------	2.0-4.0	0.20	0.20	5	3	86
	9-11	5-18	1.35-1.65	0.60-6.00	0.11-0.17	Low------	0.5-1.0	0.24	0.24			
	11-45	18-30	1.50-1.75	0.60-2.00	0.16-0.19	Low------	0.0-0.5	0.32	0.32			
	45-57	12-18	1.40-1.65	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.28	0.28			
	57-80	7-18	1.50-1.65	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.28	0.28			
Egglake---------	0-6	8-14	1.40-1.60	0.60-2.00	0.20-0.22	Low------	3.0-5.0	0.24	0.24	5	5	56
	6-12	5-12	1.40-1.65	0.60-6.00	0.12-0.19	Low------	1.0-3.0	0.24	0.24			
	12-17	12-20	1.45-1.65	0.60-2.00	0.12-0.19	Low------	0.0-0.5	0.24	0.24			
	17-52	18-30	1.50-1.65	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.28	0.28			
	52-80	10-18	1.60-1.80	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
1275C:												
Kandota---------	0-9	10-20	1.35-1.60	0.60-6.00	0.14-0.17	Low------	2.0-4.0	0.20	0.20	5	3	86
	9-13	5-18	1.35-1.65	0.60-6.00	0.11-0.17	Low------	0.5-1.0	0.24	0.24			
	13-38	18-30	1.50-1.75	0.60-2.00	0.16-0.19	Low------	0.0-0.5	0.32	0.32			
	38-55	12-18	1.40-1.65	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.28	0.28			
	55-80	7-18	1.50-1.65	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.28	0.28			
Egglake---------	0-9	8-14	1.40-1.60	0.60-2.00	0.20-0.22	Low------	3.0-5.0	0.24	0.24	5	5	56
	9-14	5-12	1.40-1.65	0.60-6.00	0.12-0.19	Low------	1.0-3.0	0.24	0.24			
	14-22	12-20	1.45-1.65	0.60-2.00	0.12-0.19	Low------	0.0-0.5	0.24	0.24			
	22-41	18-30	1.50-1.65	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.28	0.28			
	41-80	10-18	1.60-1.80	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
1276:												
Knute----------	0-10	10-18	1.35-1.65	0.60-2.00	0.13-0.18	Low------	2.0-4.0	0.20	0.20	5	3	86
	10-12	18-28	1.30-1.65	0.60-2.00	0.15-0.19	Low------	1.0-2.0	0.32	0.32			
	12-34	10-18	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.5-1.0	0.28	0.28			
	34-48	10-18	1.45-1.70	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
	48-60	10-18	1.65-1.80	0.20-0.60	0.05-0.11	Low------	0.0-0.5	0.28	0.28			
Brandsvold------	0-11	10-20	1.35-1.55	2.00-6.00	0.13-0.18	Low------	3.0-6.0	0.20	0.20	5	3	86
	11-15	10-20	1.50-1.65	2.00-6.00	0.12-0.14	Low------	0.5-2.0	0.20	0.20			
	15-29	18-27	1.45-1.65	0.60-2.00	0.15-0.19	Moderate	0.5-2.0	0.28	0.28			
	29-60	12-20	1.50-1.65	0.60-2.00	0.11-0.19	Low------	0.5-1.0	0.28	0.28			
1277D:												
Corliss---------	0-8	2-10	1.40-1.60	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.15	0.15	5	2	134
	8-20	0-10	1.50-1.65	6.00-20.00	0.03-0.10	Low------	0.0-0.5	0.10	0.15			
	20-60	0-5	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.10	0.15			
Sverdrup--------	0-9	10-18	1.35-1.50	2.00-6.00	0.13-0.15	Low------	2.0-4.0	0.20	0.20	4	3	86
	9-25	6-18	1.40-1.55	2.00-6.00	0.08-0.14	Low------	0.5-2.0	0.20	0.20			
	25-60	0-10	1.50-1.65	6.00-20.00	0.02-0.06	Low------	0.0-0.5	0.15	0.15			
1289:												
Knute----------	0-10	10-18	1.35-1.65	0.60-2.00	0.13-0.18	Low------	2.0-4.0	0.20	0.20	5	3	86
	10-13	18-28	1.30-1.65	0.60-2.00	0.15-0.19	Low------	1.0-2.0	0.32	0.32			
	13-41	12-20	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.5-1.0	0.28	0.28			
	41-53	10-18	1.45-1.70	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
	53-60	10-18	1.65-1.80	0.20-0.60	0.05-0.11	Low------	0.0-0.5	0.28	0.28			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1290:												
Brandsvold------	0-12	10-20	1.35-1.55	2.00-6.00	0.13-0.18	Low------	3.0-6.0	0.20	0.20	5	3	86
	12-17	10-20	1.50-1.65	2.00-6.00	0.12-0.14	Low------	0.5-2.0	0.20	0.20			
	17-37	18-27	1.45-1.65	0.60-2.00	0.15-0.19	Moderate	0.5-2.0	0.28	0.28			
	37-45	12-20	1.50-1.65	0.60-2.00	0.11-0.19	Low------	0.5-1.0	0.28	0.28			
	45-80	10-18	1.55-1.70	0.20-0.60	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
1291:												
Sedgeville------	0-8	0-23	1.35-1.45	0.60-2.00	0.17-0.24	Low------	4.0-12	0.28	0.28	4	8	---
	8-34	8-17	1.40-1.50	0.60-2.00	0.10-0.22	Low------	1.0-12	0.32	0.43			
	34-60	2-5	1.55-1.70	6.00-20.00	0.04-0.16	Low------	1.0-12	0.10	0.15			
1293:												
Sedgeville------	0-21	8-15	1.35-1.50	0.60-6.00	0.11-0.18	Low------	3.0-12	0.20	0.20	4	8	---
	21-40	8-17	1.40-1.50	0.60-2.00	0.10-0.22	Low------	1.0-12	0.32	0.43			
	40-60	2-5	1.55-1.70	6.00-20.00	0.04-0.16	Low------	1.0-12	0.10	0.15			
1304A:												
Glyndon---------	0-16	15-20	1.20-1.40	0.60-2.00	0.20-0.23	Low------	3.0-7.0	0.28	0.28	5	3	86
	16-29	10-18	1.30-1.50	0.60-6.00	0.17-0.20	Low------	1.0-2.0	0.43	0.43			
	29-60	5-18	1.35-1.65	2.00-6.00	0.15-0.19	Low------	0.0-0.5	0.43	0.43			
1307:												
Rushlake--------	0-5	1-5	1.50-1.70	6.00-20.00	0.04-0.07	Low------	0.5-4.0	0.15	0.15	5	1	180
	5-60	1-10	1.50-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.05	0.10			
1317:												
Vallers---------	0-14	28-35	1.20-1.35	0.20-0.60	0.18-0.22	Moderate	5.0-8.0	0.28	0.28	5	4L	86
	14-24	18-35	1.40-1.55	0.20-0.60	0.15-0.19	Moderate	1.0-3.0	0.28	0.28			
	24-60	18-35	1.50-1.70	0.20-0.60	0.17-0.19	Low------	0.0-0.5	0.37	0.37			
1319B:												
Rockwood--------	0-8	5-15	1.55-1.75	0.60-2.00	0.13-0.18	Low------	2.0-4.0	0.24	0.24	4	3	86
	8-18	5-10	1.60-1.75	0.60-2.00	0.12-0.15	Low------	---	0.28	0.28			
	18-26	8-18	1.60-1.75	0.60-2.00	0.12-0.15	Low------	---	0.28	0.28			
	26-42	8-18	1.65-1.80	0.20-0.60	0.12-0.15	Low------	---	0.28	0.28			
	42-60	7-15	1.80-2.00	0.00-0.06	0.00-0.04	Low------	---	0.24	0.24			
1319C:												
Rockwood--------	0-9	5-15	1.55-1.75	0.60-2.00	0.13-0.18	Low------	2.0-4.0	0.24	0.24	4	3	86
	9-16	5-10	1.60-1.75	0.60-2.00	0.12-0.15	Low------	---	0.28	0.28			
	16-27	8-18	1.60-1.75	0.60-2.00	0.12-0.15	Low------	---	0.28	0.28			
	27-41	8-18	1.65-1.80	0.20-0.60	0.12-0.15	Low------	---	0.28	0.28			
	41-60	7-15	1.80-2.00	0.00-0.06	0.00-0.04	Low------	---	0.24	0.24			
1319D:												
Rockwood--------	0-5	5-15	1.55-1.75	0.60-2.00	0.13-0.18	Low------	2.0-4.0	0.24	0.24	4	3	86
	5-9	5-10	1.60-1.75	0.60-2.00	0.12-0.15	Low------	---	0.28	0.28			
	9-38	8-18	1.60-1.75	0.60-2.00	0.12-0.15	Low------	---	0.28	0.28			
	38-45	8-18	1.65-1.80	0.20-0.60	0.12-0.15	Low------	---	0.28	0.28			
	45-60	7-15	1.80-2.00	0.00-0.06	0.00-0.04	Low------	---	0.24	0.24			
1320B:												
Blowers---------	0-7	5-15	1.55-1.80	0.60-2.00	0.13-0.18	Low------	2.0-6.0	0.24	0.24	4	3	86
	7-19	5-10	1.60-1.80	0.60-2.00	0.12-0.15	Low------	1.0-2.0	0.28	0.28			
	19-36	8-18	1.60-1.75	0.60-2.00	0.12-0.15	Low------	0.5-1.0	0.24	0.24			
	36-43	8-18	1.65-1.80	0.20-0.60	0.12-0.15	Low------	0.0-0.5	0.24	0.24			
	43-60	7-15	1.80-2.00	0.00-0.06	0.00-0.04	Low------	0.0-0.5	0.24	0.24			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1321:												
Paddock---------	0-8	8-15	1.45-1.75	0.60-2.00	0.13-0.18	Low------	2.0-6.0	0.24	0.24	4	3	86
	8-15	3-10	1.50-1.75	0.60-2.00	0.12-0.16	Low------	0.5-2.0	0.24	0.24			
	15-40	8-18	1.60-1.80	0.20-0.60	0.12-0.16	Low------	0.0-0.5	0.24	0.24			
	40-60	6-15	1.80-2.00	0.00-0.06	0.00-0.04	Low------	0.0-0.5	0.24	0.24			
Becida----------	0-8	10-20	1.40-1.60	0.60-2.00	0.20-0.22	Low------	3.0-7.0	0.32	0.32	4	5	56
	8-13	3-10	1.50-1.75	0.60-2.00	0.12-0.16	Low------	1.0-3.0	0.24	0.28			
	13-27	8-18	1.60-1.80	0.60-2.00	0.12-0.16	Low------	0.5-1.0	0.24	0.28			
	27-58	8-18	1.70-1.90	0.06-0.20	0.02-0.06	Low------	0.0-0.5	0.24	0.28			
	58-80	6-15	1.80-2.00	0.01-0.06	0.02-0.06	Low------	0.0-0.5	0.24	0.28			
1322:												
Wolverton-------	0-16	10-20	1.20-1.40	2.00-6.00	0.16-0.20	Low------	2.0-4.0	0.28	0.28	5	3	86
	16-34	5-15	1.30-1.50	2.00-20.00	0.06-0.09	Low------	0.5-1.0	0.20	0.20			
	34-45	2-10	1.30-1.60	2.00-20.00	0.05-0.07	Low------	0.0-0.5	0.20	0.20			
	45-80	18-35	1.40-1.60	0.20-0.60	0.14-0.19	Moderate	0.0-0.5	0.28	0.32			
1324B:												
Heimdal---------	0-8	10-20	1.30-1.60	0.60-2.00	0.20-0.22	Low------	3.0-6.0	0.24	0.24	5	5	56
	8-18	10-18	1.35-1.65	0.60-2.00	0.12-0.19	Low------	0.5-1.0	0.32	0.32			
	18-25	10-18	1.45-1.65	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.32	0.32			
	25-60	7-18	1.65-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.32	0.32			
Sisseton--------	0-8	15-20	1.20-1.30	0.60-2.00	0.16-0.18	Low------	1.0-3.0	0.32	0.32	5	4L	86
	8-22	10-18	1.20-1.35	0.60-2.00	0.16-0.20	Low------	0.0-1.0	0.32	0.32			
	22-60	10-18	1.30-1.50	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.37	0.37			
1338:												
Oakcreek--------	0-14	8-15	1.40-1.55	0.60-2.00	0.20-0.22	Low------	3.0-6.0	0.24	0.24	4	5	56
	14-33	10-18	1.50-1.65	0.60-6.00	0.12-0.17	Low------	0.5-1.0	0.37	0.37			
	33-47	2-8	1.50-1.65	6.00-20.00	0.06-0.11	Low------	0.0-0.5	0.10	0.17			
	47-80	2-4	1.60-1.75	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.05	0.15			
1339:												
Borup----------	0-10	15-27	1.20-1.40	2.00-6.00	0.20-0.23	Low------	4.0-12	0.28	0.28	5	4L	86
	10-16	10-18	1.30-1.50	2.00-6.00	0.17-0.20	Low------	0.5-1.0	0.28	0.28			
	16-60	5-18	1.35-1.65	2.00-20.00	0.15-0.19	Low------	0.0-0.5	0.28	0.28			
1340:												
Bluffcreek------	0-8	5-14	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-5.0	0.20	0.20	5	3	86
	8-31	8-18	1.45-1.65	2.00-6.00	0.10-0.14	Low------	0.0-0.5	0.15	0.20			
	31-60	1-5	1.60-1.70	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.10	0.15			
Epoufette-------	0-7	5-15	1.35-1.50	2.00-6.00	0.09-0.14	Low------	2.0-6.0	0.20	---	4	3	86
	7-10	5-15	1.40-1.55	6.00-20.00	0.05-0.07	Low------	1.0-3.0	0.17	0.17			
	10-22	8-18	1.40-1.60	2.00-6.00	0.08-0.14	Low------	0.0-0.5	0.17	0.17			
	22-60	0-8	1.40-1.65	>20.00	0.01-0.03	Low------	0.0-0.5	0.10	0.15			
1341:												
Clitherall------	0-11	8-15	1.45-1.60	2.00-6.00	0.13-0.18	Low------	2.0-6.0	0.20	0.20	4	3	86
	11-16	8-18	1.45-1.65	2.00-6.00	0.12-0.19	Low------	0.5-2.0	0.24	0.24			
	16-30	4-10	1.55-1.65	2.00-20.00	0.06-0.10	Low------	0.0-0.5	0.15	0.17			
	30-45	1-5	1.55-1.65	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.10	0.15			
	45-80	10-18	1.65-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.24	0.24			
Wykeham---------	0-8	5-18	1.30-1.55	0.60-6.00	0.13-0.18	Low------	2.0-6.0	0.17	0.20	5	3	86
	8-17	5-15	1.50-1.70	0.60-2.00	0.10-0.17	Low------	1.0-2.0	0.24	0.28			
	17-32	18-30	1.50-1.70	0.60-2.00	0.12-0.18	Moderate	0.5-1.0	0.24	0.28			
	32-60	10-18	1.55-1.75	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.24	0.28			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Kf	T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1342:												
Pinelake--------	0-10	8-18	1.35-1.55	2.00-6.00	0.13-0.18	Low------	3.0-7.0	0.20	0.20	4	3	86
	10-29	12-18	1.30-1.55	0.60-2.00	0.14-0.19	Low------	0.5-2.0	0.28	0.28			
	29-70	1-5	1.50-1.70	6.00-20.00	0.02-0.08	Low------	0.0-0.5	0.10	0.17			
	70-80	12-27	1.50-1.70	0.60-2.00	0.11-0.18	Moderate	0.0-0.5	0.28	0.28			
Brandsvold------	0-10	10-20	1.35-1.55	2.00-6.00	0.13-0.18	Low------	3.0-6.0	0.20	0.20	5	3	86
	10-12	10-20	1.50-1.65	2.00-6.00	0.12-0.14	Low------	0.5-2.0	0.20	0.20			
	12-41	18-27	1.45-1.65	0.60-2.00	0.15-0.19	Moderate	0.5-2.0	0.28	0.28			
	41-80	10-18	1.55-1.70	0.20-0.60	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
1343C:												
Lida----------	0-8	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3	86
	8-13	3-15	1.40-1.60	2.00-20.00	0.08-0.13	Low------	0.0-0.5	0.10	0.17			
	13-22	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24			
	22-38	1-5	1.55-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.05	0.15			
	38-80	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10			
Almora----------	0-9	12-20	1.35-1.55	2.00-6.00	0.13-0.18	Low------	3.0-5.0	0.20	0.20	4	3	86
	9-12	12-20	1.30-1.55	0.60-2.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28			
	12-25	18-30	1.30-1.55	0.60-2.00	0.14-0.19	Moderate	0.5-1.0	0.32	0.32			
	25-28	3-12	1.55-1.65	6.00-20.00	0.02-0.11	Low------	0.0-0.5	0.10	0.15			
	28-80	1-4	1.55-1.65	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.10	0.15			
Lizzie----------	0-8	8-18	1.30-1.45	0.60-6.00	0.16-0.22	Low------	2.0-5.0	0.24	0.24	5	3	86
	8-18	18-35	1.20-1.40	0.60-2.00	0.15-0.22	Moderate	0.0-0.5	0.37	0.37			
	18-42	8-20	1.20-1.40	0.60-2.00	0.15-0.22	Low------	0.0-0.5	0.32	0.32			
	42-80	3-16	1.30-1.65	0.60-6.00	0.08-0.22	Low------	0.0-0.5	0.32	0.32			
1344B:												
Lida----------	0-7	5-18	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.17	0.20	5	3	86
	7-23	8-18	1.45-1.65	2.00-6.00	0.08-0.17	Low------	0.5-1.0	0.15	0.24			
	23-30	1-5	1.55-1.70	6.00-20.00	0.02-0.10	Low------	0.0-0.5	0.05	0.15			
	30-80	1-5	1.60-1.70	6.00-20.00	0.01-0.07	Low------	0.0-0.5	0.05	0.10			
Almora----------	0-10	12-20	1.35-1.55	2.00-6.00	0.13-0.18	Low------	3.0-5.0	0.20	0.20	4	3	86
	10-15	12-20	1.30-1.55	0.60-2.00	0.12-0.19	Low------	1.0-2.0	0.28	0.28			
	15-39	18-30	1.30-1.55	0.60-2.00	0.14-0.19	Moderate	0.5-1.0	0.32	0.32			
	39-80	1-4	1.55-1.65	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.10	0.15			
Dent----------	0-15	8-18	1.30-1.45	0.60-6.00	0.16-0.22	Low------	2.0-6.0	0.24	0.24	5	3	86
	15-38	18-35	1.20-1.40	0.60-2.00	0.17-0.22	Moderate	0.5-1.0	0.43	0.43			
	38-62	8-27	1.20-1.40	0.60-2.00	0.15-0.22	Low------	0.0-0.5	0.43	0.43			
	62-80	5-20	1.30-1.65	0.60-2.00	0.12-0.22	Low------	0.0-0.5	0.43	0.43			
1345:												
Bluffcreek------	0-8	5-14	1.40-1.60	2.00-6.00	0.13-0.18	Low------	2.0-5.0	0.20	0.20	5	3	86
	8-19	3-10	1.45-1.65	6.00-20.00	0.08-0.10	Low------	0.0-0.5	0.15	0.15			
	19-47	8-18	1.45-1.65	2.00-6.00	0.10-0.14	Low------	0.0-0.5	0.15	0.20			
	47-60	1-5	1.60-1.70	6.00-20.00	0.02-0.07	Low------	0.0-0.5	0.10	0.15			
Rosy----------	0-9	3-12	1.40-1.55	0.60-2.00	0.14-0.19	Low------	0.5-2.0	0.24	0.24	5	3	86
	9-48	8-18	1.50-1.65	0.60-2.00	0.14-0.19	Low------	0.0-0.5	0.28	0.28			
	48-60	6-18	1.55-1.70	0.60-2.00	0.11-0.17	Low------	0.0-0.5	0.28	0.28			
1346:												
Nidaros---------	0-25	---	0.15-0.45	0.20-6.00	0.35-0.45	Low------	55-90	---	---	2	2	134
	25-42	8-35	1.50-1.80	0.60-2.00	0.13-0.22	Low------	5.0-25	0.20	0.20			
	42-60	0-4	1.45-1.70	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.15			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors K	Kf	T	Wind erodi- bility group	Wind erodi- bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1347B:												
Kandota---------	0-8	10-20	1.35-1.60	0.60-2.00	0.20-0.22	Low------	2.0-4.0	0.24	0.24	5	5	56
	8-11	5-18	1.35-1.65	0.60-6.00	0.11-0.17	Low------	0.5-1.0	0.24	0.24			
	11-26	18-30	1.50-1.75	0.60-2.00	0.16-0.19	Low------	0.0-0.5	0.32	0.32			
	26-46	12-18	1.40-1.65	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.28	0.28			
	46-80	7-18	1.50-1.65	0.60-2.00	0.12-0.17	Low------	0.0-0.5	0.28	0.28			
1348:												
Knute----------	0-11	12-20	1.30-1.60	0.60-2.00	0.20-0.22	Low------	2.0-4.0	0.24	0.24	5	5	56
	11-16	18-28	1.30-1.65	0.60-2.00	0.15-0.19	Low------	1.0-2.0	0.32	0.32			
	16-45	10-18	1.40-1.65	0.60-2.00	0.11-0.19	Low------	0.5-1.0	0.28	0.28			
	45-65	10-18	1.45-1.70	0.60-2.00	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
	65-80	10-18	1.65-1.80	0.20-0.60	0.05-0.11	Low------	0.0-0.5	0.28	0.28			
1349:												
Clotho----------	0-14	10-25	1.50-1.60	0.60-2.00	0.20-0.22	Moderate	4.0-8.0	0.24	0.24	5	4L	86
	14-28	8-18	1.60-1.70	0.20-0.60	0.12-0.17	Low------	0.5-2.0	0.28	0.28			
	28-60	8-15	1.65-1.75	0.60-2.00	0.11-0.14	Low------	0.0-0.5	0.28	0.28			
1350:												
Brandsvold------	0-13	10-20	1.30-1.50	0.60-2.00	0.20-0.22	Low------	3.0-6.0	0.24	0.24	5	5	56
	13-61	18-27	1.45-1.65	0.60-2.00	0.15-0.19	Moderate	0.5-2.0	0.28	0.28			
	61-80	10-18	1.55-1.70	0.20-0.60	0.11-0.19	Low------	0.0-0.5	0.28	0.28			
1351:												
Bluffton--------	0-10	14-25	1.35-1.50	0.60-2.00	0.20-0.24	Low------	4.0-12	0.24	0.24	5	5	56
	10-53	18-30	1.45-1.55	0.60-2.00	0.15-0.17	Low------	0.5-2.0	0.32	0.32			
	53-80	16-24	1.50-1.65	0.60-2.00	0.15-0.19	Low------	0.0-0.5	0.32	0.32			
1365:												
Hillview--------	0-7	5-15	1.25-1.40	2.00-6.00	0.13-0.18	Low------	2.0-4.0	0.20	0.20	5	3	86
	7-15	3-12	1.35-1.55	2.00-6.00	0.10-0.14	Low------	0.5-1.0	0.17	0.17			
	15-29	8-18	1.35-1.55	2.00-6.00	0.12-0.19	Low------	0.5-1.0	0.24	0.24			
	29-60	3-12	1.35-1.65	2.00-6.00	0.08-0.17	Low------	0.0-0.5	0.28	0.28			
1396:												
Sedgeville------	0-7	0-23	1.35-1.45	0.60-2.00	0.17-0.24	Low------	4.0-12	0.28	0.28	4	8	---
	7-24	8-17	1.40-1.50	0.60-2.00	0.10-0.22	Low------	1.0-12	0.32	0.43			
	24-60	2-5	1.55-1.70	6.00-20.00	0.04-0.16	Low------	1.0-12	0.10	0.15			
Nidaros---------	0-21	---	0.15-0.45	0.20-6.00	0.35-0.45	---------	55-85	---	---	2	2	134
	21-27	8-35	1.50-1.80	0.60-2.00	0.13-0.22	Low------	5.0-15	0.24	0.24			
	27-80	0-4	1.40-1.65	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.15			
Aquolls---------	0-10	10-20	1.35-1.50	0.60-2.00	0.20-0.22	Low------	3.0-6.0	0.28	0.28	5	3	86
	10-24	12-27	1.45-1.65	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.28	0.28			
	24-60	2-18	1.50-1.70	0.60-6.00	0.10-0.18	Low------	0.0-0.5	0.20	0.24			
1397:												
Bemidji---------	0-8	2-10	1.45-1.65	6.00-20.00	0.10-0.12	Low------	1.0-3.0	0.17	0.17	5	2	134
	8-36	2-10	1.45-1.65	6.00-20.00	0.06-0.11	Low------	0.5-1.0	0.15	0.15			
	36-45	12-27	1.50-1.80	0.60-2.00	0.12-0.18	Low------	0.0-0.5	0.32	0.32			
	45-60	7-18	1.60-1.80	0.60-2.00	0.11-0.16	Low------	0.0-0.5	0.24	0.24			
1825B:												
Seelyeville-----	0-60	---	0.10-0.25	0.20-6.00	0.35-0.45	---------	25-99	0.10	0.10	3	8	---
1874:												
Radium----------	0-11	1-8	1.55-1.75	6.00-20.00	0.06-0.12	Low------	1.0-3.0	0.17	0.17	5	2	134
	11-18	1-8	1.55-1.75	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.10			
	18-24	1-8	1.55-1.75	20.00-40.00	0.02-0.05	Low------	0.0-0.5	0.05	0.17			
	24-60	1-5	1.55-1.75	6.00-20.00	0.03-0.09	Low------	0.0-0.5	0.10	0.17			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Shrink-swell potential	Organic matter	Erosion factors K	Erosion factors Kf	Erosion factors T	Wind erodi-bility group	Wind erodi-bility index
	In	Pct	g/cc	In/hr	In/in		Pct					
1943:												
Roscommon-------	0-6	2-12	0.90-1.60	6.00-20.00	0.07-0.20	Low------	4.0-8.0	0.17	0.17	5	2	134
	6-60	0-10	1.45-1.75	6.00-20.00	0.05-0.07	Low------	---	0.17	0.17			
1975:												
Oylen----------	0-13	7-12	1.50-1.70	2.00-6.00	0.12-0.16	Low------	2.0-4.0	0.20	0.20	3	3	86
	13-22	7-18	1.60-1.70	0.60-2.00	0.12-0.18	Low------	0.5-2.0	0.24	0.24			
	22-26	2-6	1.45-1.60	6.00-20.00	0.03-0.08	Low------	0.0-0.5	0.10	0.10			
	26-60	0-4	1.45-1.60	6.00-20.00	0.03-0.07	Low------	0.0-0.5	0.10	0.10			

Chemical Properties of the Soils

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
7A:								
Hubbard---------	0-20	4-10	6.0-16.0	5.1-7.3	---	---	---	---
	20-45	1-5	1.0-4.0	5.1-7.3	---	---	---	---
	45-60	0-5	0.0-4.0	5.6-7.8	0-15	---	---	---
7B:								
Hubbard---------	0-12	4-10	6.0-16.0	5.1-7.3	---	---	---	---
	12-42	1-5	1.0-4.0	5.1-7.3	---	---	---	---
	42-60	0-5	0.0-4.0	5.6-7.8	0-15	---	---	---
7C:								
Hubbard---------	0-9	4-10	6.0-16.0	5.1-7.3	---	---	---	---
	9-34	1-5	1.0-4.0	5.1-7.3	---	---	---	---
	34-60	0-5	0.0-4.0	5.6-7.8	0-15	---	---	---
26:								
Aazdahl---------	0-13	27-35	20.0-30.0	6.6-7.3	---	---	---	---
	13-23	27-35	14.0-24.0	6.6-7.8	---	---	---	---
	23-36	24-35	12.0-18.0	7.4-8.4	15-30	---	---	---
	36-60	24-35	12.0-18.0	7.4-8.4	10-20	---	---	---
34:								
Parnell---------	0-18	27-40	25.0-40.0	6.1-7.8	---	---	0-2	---
	18-50	35-60	19.0-29.0	6.1-7.8	0-3	0-2	0-2	0-1
	50-60	35-45	16.0-24.0	6.6-8.4	0-10	0-2	0-2	0-1
38B:								
Waukon----------	0-8	12-27	9.0-28.0	6.1-7.3	---	---	---	---
	8-32	18-35	7.0-21.0	6.1-8.4	0-30	---	---	---
	32-60	18-30	7.0-18.0	7.4-8.4	5-30	---	---	---
38C2:								
Waukon----------	0-8	12-27	9.0-28.0	6.1-7.3	---	---	---	---
	8-27	18-35	7.0-21.0	6.1-8.4	0-30	---	---	---
	27-60	18-30	7.0-18.0	7.4-8.4	5-30	---	---	---
38D2:								
Waukon----------	0-7	12-27	9.0-28.0	6.1-7.3	---	---	---	---
	7-22	18-35	7.0-21.0	6.1-8.4	0-30	---	---	---
	22-60	18-30	7.0-18.0	7.4-8.4	5-30	---	---	---
38E:								
Waukon----------	0-9	12-27	9.0-28.0	6.1-7.3	---	---	---	---
	9-26	18-35	7.0-21.0	6.1-8.4	0-30	---	---	---
	26-60	18-30	7.0-18.0	7.4-8.4	5-30	---	---	---
46:								
Borup----------	0-13	15-27	15.0-30.0	7.4-8.4	10-25	---	0-4	---
	13-32	10-18	6.0-15.0	7.4-8.4	15-40	---	0-4	---
	32-60	5-18	3.0-10.0	7.4-8.4	10-30	---	0-4	---
53B:								
Kandota---------	0-8	10-20	8.0-20.0	5.6-7.3	---	---	---	---
	8-11	5-18	3.0-13.0	5.1-6.5	---	---	---	---
	11-32	18-30	7.0-19.0	5.6-7.3	---	---	---	---
	32-68	12-18	5.0-12.0	7.4-8.4	15-25	---	---	---
	68-80	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
53C:								
Kandota---------	0-8	10-20	8.0-20.0	5.6-7.3	---	---	---	---
	8-24	18-30	7.0-19.0	5.6-7.3	---	---	---	---
	24-60	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---
53D:								
Kandota---------	0-7	10-20	8.0-20.0	5.6-7.3	---	---	---	---
	7-9	5-18	3.0-13.0	5.1-6.5	---	---	---	---
	9-28	18-30	7.0-19.0	5.6-7.3	---	---	---	---
	28-60	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---
58:								
Kittson---------	0-7	10-27	12.0-26.0	6.6-7.8	---	---	---	---
	7-18	18-30	10.0-20.0	6.6-7.8	0-5	---	---	---
	18-32	18-30	10.0-16.0	7.4-8.4	15-30	---	---	---
	32-60	18-30	10.0-16.0	7.4-8.4	10-20	---	---	---
59:								
Grimstad--------	0-10	10-18	10.0-18.0	7.4-8.4	5-15	---	---	---
	10-27	2-15	2.0-12.0	7.4-9.0	5-20	0-3	---	---
	27-60	10-30	4.0-16.0	7.4-9.0	15-35	0-3	---	---
61:								
Arveson---------	0-10	20-27	19.0-23.0	7.4-8.4	5-20	---	---	---
	10-30	10-27	7.0-11.0	7.4-8.4	15-30	---	---	---
	30-60	5-20	5.0-8.0	7.4-8.4	10-20	---	---	---
63:								
Rockwell--------	0-10	20-30	15.0-30.0	7.4-8.4	10-20	---	---	---
	10-27	5-30	5.0-15.0	7.9-8.4	15-30	---	---	---
	27-36	3-10	2.0-6.0	7.4-7.8	10-20	---	---	---
	36-60	15-30	5.0-15.0	7.4-7.8	10-20	---	---	---
65:								
Foxhome---------	0-13	10-20	10.0-24.0	6.6-7.8	---	---	---	---
	13-16	10-25	6.0-18.0	6.6-7.8	0-10	---	---	---
	16-35	5-15	2.0-10.0	7.4-8.4	5-15	---	---	---
	35-60	12-35	6.0-18.0	7.4-8.4	15-30	---	---	---
66:								
Flaming---------	0-16	2-10	4.0-13.0	5.6-7.3	---	---	---	---
	16-60	2-10	1.0-6.0	5.6-8.4	0-15	---	---	---
68:								
Arveson---------	0-16	20-27	22.0-34.0	7.4-8.4	5-20	---	---	---
	16-23	10-27	6.0-16.0	7.4-8.4	15-30	---	---	---
	23-60	5-20	2.0-11.0	7.4-8.4	10-20	---	---	---
107:								
Winger----------	0-16	18-27	17.0-26.0	7.4-8.4	5-20	---	---	---
	16-29	18-35	10.0-22.0	7.4-8.4	15-35	---	---	---
	29-60	18-32	9.0-17.0	7.4-8.4	15-25	---	---	---
108:								
McIntosh--------	0-12	18-27	19.0-36.0	7.4-8.4	5-30	---	---	---
	12-25	18-35	15.0-38.0	7.4-8.4	20-35	0-1	---	---
	25-60	18-35	9.0-27.0	7.4-8.4	5-30	0-1	---	---
121:								
Wykeham---------	0-8	5-18	6.0-23.0	5.1-6.5	---	---	---	---
	8-14	5-15	4.0-13.0	5.1-6.5	---	---	---	---
	14-28	18-30	8.0-20.0	5.6-7.3	---	---	---	---
	28-60	10-18	4.0-12.0	7.4-8.4	10-25	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
127A:								
Sverdrup--------	0-7	10-18	9.0-17.0	6.1-7.3	---	---	---	---
	7-17	6-18	4.0-13.0	6.1-7.8	---	---	---	---
	17-60	0-10	0.0-6.0	7.4-8.4	---	---	---	---
127B:								
Sverdrup--------	0-12	10-18	9.0-17.0	6.1-7.3	---	---	---	---
	12-24	6-18	4.0-13.0	6.1-7.8	---	---	---	---
	24-60	0-10	0.0-6.0	7.4-8.4	---	---	---	---
127C:								
Sverdrup--------	0-8	10-18	9.0-17.0	6.1-7.3	---	---	---	---
	8-15	6-18	4.0-13.0	6.1-7.8	---	---	---	---
	15-60	0-10	0.0-6.0	7.4-8.4	---	---	---	---
141B:								
Egeland---------	0-15	10-18	15.0-20.0	5.6-7.3	---	---	0-2	---
	15-42	10-18	15.0-20.0	6.1-7.8	---	---	0-2	---
	42-60	5-10	5.0-15.0	6.6-8.4	5-20	---	0-2	---
141C:								
Egeland---------	0-11	10-18	15.0-20.0	5.6-7.3	---	---	0-2	---
	11-35	10-18	15.0-20.0	6.1-7.8	---	---	0-2	---
	35-60	5-10	5.0-15.0	6.6-8.4	5-20	---	0-2	---
141D:								
Egeland---------	0-9	10-18	15.0-20.0	5.6-7.3	---	---	0-2	---
	9-30	10-18	15.0-20.0	6.1-7.8	---	---	0-2	---
	30-60	5-10	5.0-15.0	6.6-8.4	5-20	---	0-2	---
168B:								
Forman----------	0-9	27-30	19.0-34.0	6.6-7.8	---	---	0-2	---
	9-24	30-35	13.0-23.0	6.6-7.8	---	---	0-2	---
	24-60	18-35	7.0-22.0	7.4-8.4	15-30	---	0-4	---
180:								
Gonvick---------	0-15	10-27	8.0-24.0	6.1-7.3	---	---	---	---
	15-35	22-35	12.0-24.0	6.6-7.3	0-5	---	---	---
	35-60	18-35	8.0-18.0	7.4-8.4	10-25	---	---	---
184:								
Hamerly---------	0-10	18-27	15.0-30.0	6.6-8.4	0-15	---	---	---
	10-38	18-30	8.0-20.0	7.4-8.4	15-30	---	---	---
	38-60	18-30	7.0-19.0	7.4-8.4	10-25	---	---	---
187:								
Haug----------	0-14	---	100-180	6.6-7.8	0-5	---	---	---
	14-20	10-18	14.0-26.0	6.6-8.4	5-30	---	---	---
	20-60	10-18	10.0-16.0	7.4-8.4	5-30	---	---	---
191:								
Epoufette-------	0-7	5-15	10.0-20.0	6.1-7.3	---	---	---	---
	7-33	8-18	4.0-10.0	6.6-7.8	0-10	---	---	---
	33-60	0-8	1.0-5.0	7.4-8.4	5-10	---	---	---
202:								
Meehan----------	0-8	4-10	2.0-15.0	3.5-7.3	---	---	---	---
	8-24	4-9	1.0-8.0	3.5-6.5	---	---	---	---
	24-60	1-4	0.0-4.0	3.5-7.3	---	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
258A:								
Sandberg--------	0-11	2-10	2.0-12.0	5.6-7.8	0-5	---	---	---
	11-33	0-10	1.0-6.0	6.1-7.8	0-5	---	---	---
	33-60	0-5	1.0-4.0	7.4-8.4	5-10	---	---	---
258B:								
Sandberg--------	0-12	2-10	2.0-12.0	5.6-7.8	0-5	---	---	---
	12-19	0-10	1.0-6.0	6.1-7.8	0-5	---	---	---
	19-29	0-5	1.0-6.0	7.4-8.4	10-25	---	---	---
	29-80	0-5	1.0-4.0	7.4-8.4	5-10	---	---	---
258C:								
Sandberg--------	0-10	2-10	2.0-12.0	5.6-7.8	0-5	---	---	---
	10-17	0-10	1.0-6.0	6.1-7.8	0-5	---	---	---
	17-44	0-5	1.0-6.0	7.4-8.4	10-25	---	---	---
	44-60	0-5	1.0-4.0	7.4-8.4	5-10	---	---	---
260:								
Duelm----------	0-16	2-10	5.0-18.0	5.6-7.3	---	---	---	---
	16-56	1-8	0.0-4.0	5.1-7.3	---	---	---	---
	56-60	0-6	0.0-5.0	5.6-7.8	0-5	---	---	---
267B:								
Snellman--------	0-9	5-18	4.0-16.0	5.1-6.5	---	---	---	---
	9-15	5-15	3.0-14.0	5.1-6.5	---	---	---	---
	15-31	18-30	8.0-16.0	5.6-7.3	---	---	---	---
	31-60	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---
267C:								
Snellman--------	0-7	5-18	4.0-16.0	5.1-6.5	---	---	---	---
	7-15	5-15	3.0-14.0	5.1-6.5	---	---	---	---
	15-31	18-30	8.0-16.0	5.6-7.3	---	---	---	---
	31-45	7-18	3.0-10.0	7.4-8.4	15-25	---	---	---
	45-60	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---
267E:								
Snellman--------	0-3	5-18	4.0-16.0	5.1-6.5	---	---	---	---
	3-14	5-15	3.0-14.0	5.1-6.5	---	---	---	---
	14-26	18-30	8.0-16.0	5.6-7.3	---	---	---	---
	26-39	7-18	3.0-10.0	7.4-8.4	15-25	---	---	---
	39-60	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---
267F:								
Snellman--------	0-3	5-18	4.0-16.0	5.1-6.5	---	---	---	---
	3-16	5-15	3.0-14.0	5.1-6.5	---	---	---	---
	16-32	18-30	8.0-16.0	5.6-7.3	---	---	---	---
	32-40	7-18	3.0-10.0	7.4-8.4	15-25	---	---	---
	40-60	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---
290:								
Rothsay---------	0-14	10-18	10.0-20.0	6.6-7.3	---	---	---	---
	14-22	10-18	6.0-12.0	6.6-7.8	---	---	---	---
	22-31	5-18	5.0-10.0	7.4-8.4	15-30	---	---	---
	31-60	5-18	5.0-10.0	7.4-8.4	10-20	---	---	---
293B:								
Swenoda---------	0-15	10-20	10.0-23.0	6.1-7.3	---	---	0-2	---
	15-29	10-18	8.0-14.0	6.6-7.8	0-3	---	0-2	---
	29-60	20-35	11.0-19.0	7.4-8.4	10-30	---	0-4	---
335:								
Urness----------	0-9	18-27	40.0-50.0	7.4-8.4	5-25	---	---	---
	9-60	18-35	40.0-50.0	7.4-8.4	5-25	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
339:								
Fordville-------	0-10	18-25	21.0-27.0	6.1-7.3	0-1	---	0-2	---
	10-29	18-30	21.0-27.0	6.1-7.8	0-5	---	0-2	---
	29-37	15-30	15.0-25.0	6.1-8.4	2-25	---	0-2	---
	37-60	0-5	1.0-10.0	7.4-8.4	2-20	---	0-2	---
341A:								
Arvilla---------	0-13	6-18	5.0-20.0	6.1-8.4	---	---	---	---
	13-20	6-18	5.0-15.0	6.6-8.4	---	---	---	---
	20-60	2-10	1.0-5.0	7.4-8.4	1-5	---	---	---
341B:								
Arvilla---------	0-9	6-18	5.0-20.0	6.1-8.4	---	---	---	---
	9-19	6-18	5.0-15.0	6.6-8.4	---	---	---	---
	19-60	2-10	1.0-5.0	7.4-8.4	1-5	---	---	---
371:								
Clontarf--------	0-13	10-18	9.0-17.0	6.1-7.3	---	---	---	---
	13-24	10-18	6.0-11.0	6.1-7.8	0-15	---	---	---
	24-60	5-10	3.0-6.0	6.6-7.8	0-15	---	---	---
375:								
Forada----------	0-18	10-22	14.0-30.0	6.1-7.8	0-15	---	---	---
	18-36	8-18	4.0-12.0	6.1-7.8	0-15	---	---	---
	36-60	0-5	0.0-5.0	6.6-8.4	0-10	---	---	---
402C:								
Sioux----------	0-10	3-10	---	6.6-8.4	---	---	0-2	---
	10-60	0-10	---	7.4-8.4	---	---	0-2	---
402E:								
Sioux----------	0-10	3-10	---	6.6-8.4	---	---	0-2	---
	10-60	0-10	---	7.4-8.4	---	---	0-2	---
406A:								
Dorset----------	0-11	4-18	10.0-23.0	5.6-7.3	---	---	---	---
	11-20	10-18	7.0-17.0	5.6-7.3	---	---	---	---
	20-60	0-5	0.0-5.0	7.4-8.4	5-15	---	---	---
406B:								
Dorset----------	0-11	4-18	10.0-23.0	5.6-7.3	---	---	---	---
	11-20	10-18	7.0-17.0	5.6-7.3	---	---	---	---
	20-38	5-10	3.0-8.0	7.4-8.4	10-25	---	---	---
	38-60	0-5	0.0-5.0	7.4-8.4	5-15	---	---	---
418:								
Lamoure---------	0-32	27-34	25.0-32.0	7.4-8.4	0-10	---	0-4	1-2
	32-40	20-34	24.0-31.0	7.4-8.4	9-20	---	0-4	1-3
	40-48	20-34	20.0-29.0	7.4-8.4	9-20	0-1	0-4	1-3
	48-60	20-34	16.0-23.0	7.4-8.4	4-20	0-2	0-4	1-3
422B:								
Bygland---------	0-10	27-40	20.0-40.0	6.1-7.3	---	---	---	---
	10-41	35-60	15.0-30.0	6.1-7.8	0-5	---	---	---
	41-46	18-40	10.0-25.0	7.4-8.4	10-20	0-2	---	---
	46-60	18-40	10.0-20.0	7.4-8.4	5-15	0-3	---	---
422C:								
Bygland---------	0-8	27-40	20.0-40.0	6.1-7.3	---	---	---	---
	8-16	35-60	15.0-30.0	6.1-7.8	0-5	---	---	---
	16-22	18-40	10.0-25.0	7.4-8.4	10-20	0-2	---	---
	22-60	18-40	10.0-20.0	7.4-8.4	5-15	0-3	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
426:								
Foldahl---------	0-14	4-9	4.0-14.0	6.1-7.8	---	---	---	---
	14-26	2-10	2.0-8.0	6.6-7.8	0-10	---	---	---
	26-40	18-35	6.0-18.0	7.4-8.4	15-30	---	---	---
	40-60	18-35	6.0-18.0	7.4-8.4	10-20	---	---	---
441A:								
Almora----------	0-11	12-20	12.0-20.0	5.6-7.3	---	---	---	---
	11-15	12-20	8.0-14.0	5.6-7.3	---	---	---	---
	15-38	18-30	10.0-17.0	5.6-7.3	---	---	---	---
	38-46	3-12	2.0-7.0	5.6-7.8	0-5	---	---	---
	46-60	1-4	1.0-3.0	7.4-8.4	5-30	---	---	---
441B:								
Almora----------	0-9	12-20	12.0-20.0	5.6-7.3	---	---	---	---
	9-13	12-20	8.0-14.0	5.6-7.3	---	---	---	---
	13-27	18-30	10.0-17.0	5.6-7.3	---	---	---	---
	27-60	1-4	1.0-3.0	7.4-8.4	5-30	---	---	---
441C:								
Almora----------	0-10	12-20	12.0-20.0	5.6-7.3	---	---	---	---
	10-13	12-20	8.0-14.0	5.6-7.3	---	---	---	---
	13-33	18-30	10.0-17.0	5.6-7.3	---	---	---	---
	33-60	1-4	1.0-3.0	7.4-8.4	5-30	---	---	---
481:								
Kratka----------	0-9	5-15	6.0-20.0	5.6-7.8	0-15	---	---	---
	9-25	2-10	1.0-8.0	5.6-7.8	0-15	---	---	---
	25-60	10-35	4.0-21.0	6.1-8.4	0-30	---	---	---
494:								
Darnen----------	0-36	18-27	17.0-32.0	6.6-7.8	---	---	---	---
	36-43	18-30	11.0-21.0	6.1-7.8	---	---	---	---
	43-60	18-30	9.0-16.0	7.4-8.4	0-10	---	---	---
497:								
Hantho----------	0-9	10-27	14.0-34.0	6.6-7.8	---	---	---	---
	9-22	10-18	10.0-22.0	6.6-7.8	---	---	---	---
	22-31	10-18	6.0-16.0	7.4-8.4	5-20	---	---	---
	31-60	10-35	6.0-29.0	7.4-8.4	5-20	---	---	---
508:								
Wyndmere--------	0-12	5-15	10.0-25.0	6.6-8.4	10-20	0-1	---	0-1
	12-38	3-15	3.0-20.0	7.4-8.4	15-35	0-1	0-2	0-1
	38-60	3-15	2.0-10.0	7.4-8.4	5-20	0-1	0-2	0-3
540:								
Seelyeville-----	0-8	---	140-200	4.5-7.3	---	---	---	---
	8-80	---	140-200	4.5-7.3	---	---	---	---
541:								
Rifle----------	0-21	---	150-180	4.5-7.3	---	---	---	---
	21-80	---	50-150	4.5-7.3	---	---	---	---
544:								
Cathro----------	0-16	---	120-170	4.5-7.8	---	---	---	---
	16-38	---	120-170	4.5-7.8	---	---	---	---
	38-60	10-30	2.0-25.0	6.6-8.4	5-25	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
567A:								
Verndale--------	0-9	7-12	7.0-15.0	5.6-7.3	---	---	---	---
	9-21	7-18	3.0-12.0	5.6-7.3	---	---	---	---
	21-38	2-6	2.0-4.0	5.6-7.3	---	---	---	---
	38-60	0-4	0.0-3.0	6.1-8.4	0-30	---	---	---
567B:								
Verndale--------	0-10	7-12	7.0-15.0	5.6-7.3	---	---	---	---
	10-18	7-18	3.0-12.0	5.6-7.3	---	---	---	---
	18-29	2-6	2.0-4.0	5.6-7.3	---	---	---	---
	29-60	0-4	0.0-3.0	6.1-8.4	0-30	---	---	---
609B:								
Dickey----------	0-13	2-14	---	6.1-7.8	---	---	0-2	---
	13-28	2-14	---	6.1-7.8	---	---	0-2	---
	28-60	18-39	---	7.4-8.4	---	---	0-2	---
624:								
Rosy----------	0-9	3-12	1.0-15.0	5.1-7.3	---	---	---	---
	9-26	8-18	4.0-10.0	5.1-7.3	---	---	---	---
	26-60	6-18	3.0-10.0	5.6-8.4	0-30	---	---	---
646C:								
Peever----------	0-9	27-35	25.0-30.0	6.1-7.3	---	---	0-2	---
	9-18	35-50	25.0-30.0	6.6-7.8	15-20	0-5	0-2	0-5
	18-37	30-45	20.0-25.0	7.4-8.4	10-15	0-10	0-4	0-10
	37-60	30-45	15.0-25.0	7.4-8.4	10-15	0-10	0-8	0-10
646D:								
Peever----------	0-8	27-35	25.0-30.0	6.1-7.3	---	---	0-2	---
	8-21	35-50	25.0-30.0	6.6-7.8	15-20	0-5	0-2	0-5
	21-60	30-45	15.0-25.0	7.4-8.4	10-15	0-10	0-8	0-10
670:								
Knute----------	0-9	10-18	8.0-18.0	6.1-7.3	---	---	---	---
	9-22	18-28	8.0-19.0	6.1-7.8	---	---	---	---
	22-29	10-18	4.0-12.0	7.4-8.4	20-30	---	---	---
	29-60	10-18	4.0-12.0	7.4-8.4	15-25	---	---	---
680:								
Parnell---------	0-27	22-27	22.0-35.0	6.1-7.8	---	---	0-2	---
	27-49	35-60	19.0-29.0	6.1-7.8	0-3	0-2	0-2	0-1
	49-60	22-40	16.0-24.0	6.6-8.4	0-10	0-2	0-2	0-1
698:								
Doran----------	0-9	27-35	20.0-35.0	6.6-7.3	---	---	---	---
	9-19	35-50	17.0-25.0	6.6-7.8	---	---	---	---
	19-32	20-40	12.0-20.0	7.4-8.4	3-25	---	---	---
	32-60	20-40	12.0-18.0	7.4-8.4	3-25	---	---	---
701:								
Runeberg--------	0-10	10-25	12.0-40.0	6.1-7.3	---	---	---	---
	10-36	10-18	4.0-14.0	6.1-7.3	---	---	---	---
	36-60	6-15	2.0-9.0	7.4-8.4	---	---	---	---
705B:								
Nitche----------	0-16	8-18	---	5.6-7.3	---	---	---	---
	16-24	8-18	---	5.6-7.3	---	---	---	---
	24-33	5-10	---	5.6-7.3	---	---	---	---
	33-55	1-5	---	7.4-8.4	5-20	---	---	---
	55-80	10-18	---	7.4-8.4	5-20	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
705B:								
Kandota---------	0-7	10-20	8.0-20.0	5.6-7.3	---	---	---	---
	7-11	5-18	3.0-13.0	5.1-6.5	---	---	---	---
	11-28	18-30	7.0-19.0	5.6-7.3	---	---	---	---
	28-48	12-18	5.0-12.0	7.4-8.4	15-25	---	---	---
	48-80	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---
Lida----------	0-9	5-18	6.0-19.0	5.6-7.3	---	---	---	---
	9-19	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	19-28	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	28-60	1-5	1.0-4.0	7.4-8.4	3-15	---	---	---
705C:								
Nitche----------	0-15	8-18	---	5.6-7.3	---	---	---	---
	15-23	8-18	---	5.6-7.3	---	---	---	---
	23-41	5-10	---	5.6-7.3	---	---	---	---
	41-60	10-18	---	7.4-8.4	5-20	---	---	---
Kandota---------	0-7	10-20	8.0-20.0	5.6-7.3	---	---	---	---
	7-13	5-18	3.0-13.0	5.1-6.5	---	---	---	---
	13-33	18-30	7.0-19.0	5.6-7.3	---	---	---	---
	33-47	12-18	5.0-12.0	7.4-8.4	15-25	---	---	---
	47-60	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---
Lida----------	0-6	5-18	6.0-19.0	5.6-7.3	---	---	---	---
	6-17	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	17-28	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	28-60	1-5	1.0-4.0	7.4-8.4	3-15	---	---	---
707B:								
Lizzie----------	0-9	18-22	9.0-23.0	6.1-7.3	---	---	---	---
	9-26	18-35	8.0-22.0	6.1-7.3	---	---	---	---
	26-32	8-20	6.0-13.0	7.4-8.4	12-35	---	---	---
	32-60	3-16	2.0-10.0	7.4-8.4	12-35	---	---	---
707C2:								
Lizzie----------	0-10	18-22	9.0-23.0	6.1-7.3	---	---	---	---
	10-35	18-35	8.0-22.0	6.1-7.3	---	---	---	---
	35-40	8-20	6.0-13.0	7.4-8.4	12-35	---	---	---
	40-80	3-16	2.0-10.0	7.4-8.4	12-35	---	---	---
707D2:								
Lizzie----------	0-8	18-22	9.0-23.0	6.1-7.3	---	---	---	---
	8-21	18-35	8.0-22.0	6.1-7.3	---	---	---	---
	21-35	8-20	6.0-13.0	7.4-8.4	12-35	---	---	---
	35-60	3-16	2.0-10.0	7.4-8.4	12-35	---	---	---
710:								
Friberg---------	0-19	10-24	15.0-26.0	5.6-7.8	---	---	---	---
	19-47	22-35	12.0-22.0	5.6-7.3	0-5	---	---	---
	47-60	10-22	5.0-10.0	7.4-8.4	5-30	---	---	---
Weetown---------	0-9	10-20	12.0-36.0	6.1-7.3	---	---	---	---
	9-31	10-22	8.0-29.0	6.1-7.3	---	---	---	---
	31-51	18-28	8.0-19.0	5.6-7.3	---	---	---	---
	51-60	10-18	4.0-12.0	7.4-8.4	5-30	---	---	---
711B:								
Arvilla---------	0-13	6-18	5.0-20.0	6.1-8.4	---	---	---	---
	13-19	6-18	5.0-15.0	6.6-8.4	---	---	---	---
	19-60	2-10	1.0-5.0	7.4-8.4	1-5	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
711B:								
Sandberg--------	0-12	5-15	4.0-16.0	5.6-7.8	0-5	---	---	---
	12-20	0-10	1.0-6.0	6.1-7.8	0-5	---	---	---
	20-32	0-5	1.0-6.0	7.4-8.4	10-25	---	---	---
	32-60	0-5	1.0-4.0	7.4-8.4	5-10	---	---	---
711C:								
Arvilla---------	0-8	6-18	5.0-20.0	6.1-8.4	---	---	---	---
	8-15	6-18	5.0-15.0	6.6-8.4	---	---	---	---
	15-60	2-10	1.0-5.0	7.4-8.4	1-5	---	---	---
Sandberg--------	0-7	5-15	4.0-16.0	5.6-7.8	0-5	---	---	---
	7-14	0-10	1.0-6.0	6.1-7.8	0-5	---	---	---
	14-60	0-5	1.0-4.0	7.4-8.4	5-10	---	---	---
715:								
Bluffcreek------	0-8	5-14	6.0-18.0	5.6-7.3	---	---	---	---
	8-26	3-10	1.0-7.0	5.6-7.3	---	---	---	---
	26-42	8-18	3.0-12.0	5.6-7.3	---	---	---	---
	42-80	1-5	0.0-4.0	6.1-8.4	0-30	---	---	---
Clearriver------	0-9	5-15	4.0-13.0	5.1-6.5	---	---	---	---
	9-48	3-10	1.0-6.0	5.1-7.3	---	---	---	---
	48-60	1-5	1.0-3.0	6.6-7.8	1-10	---	---	---
716B:								
Leaflake--------	0-8	2-10	2.0-13.0	5.6-7.3	---	---	---	---
	8-26	2-10	1.0-6.0	5.6-7.3	---	---	---	---
	26-51	15-28	7.0-14.0	5.1-7.3	---	---	---	---
	51-60	10-18	5.0-10.0	6.6-8.4	0-20	---	---	---
Eagleview-------	0-9	2-10	10.0-15.0	5.6-7.3	---	---	---	---
	9-36	2-10	10.0-15.0	5.6-7.3	---	---	---	---
	36-54	2-10	5.0-10.0	6.1-7.3	---	---	---	---
	54-60	2-10	0.0-5.0	6.1-8.4	0-10	---	---	---
716C:								
Leaflake--------	0-3	2-10	2.0-13.0	5.6-7.3	---	---	---	---
	3-34	2-10	1.0-6.0	5.6-7.3	---	---	---	---
	34-71	15-28	7.0-14.0	5.1-7.3	---	---	---	---
	71-80	10-18	5.0-10.0	6.6-8.4	0-20	---	---	---
Eagleview-------	0-3	2-10	10.0-15.0	5.6-7.3	---	---	---	---
	3-46	2-10	10.0-15.0	5.6-7.3	---	---	---	---
	46-78	2-10	5.0-10.0	6.1-7.3	---	---	---	---
	78-80	2-10	0.0-5.0	6.1-8.4	0-10	---	---	---
716D:								
Leaflake--------	0-6	2-10	2.0-13.0	5.6-7.3	---	---	---	---
	6-23	2-10	1.0-6.0	5.6-7.3	---	---	---	---
	23-39	15-28	7.0-14.0	5.1-7.3	---	---	---	---
	39-60	10-18	5.0-10.0	6.6-8.4	0-20	---	---	---
Eagleview-------	0-3	2-10	10.0-15.0	5.6-7.3	---	---	---	---
	3-42	2-10	10.0-15.0	5.6-7.3	---	---	---	---
	42-60	2-10	5.0-10.0	6.1-7.3	---	---	---	---
718E:								
Naytahwaush-----	0-5	10-20	15.0-28.0	5.6-7.3	---	---	---	---
	5-10	8-15	6.0-18.0	5.6-7.3	---	---	---	---
	10-31	35-60	15.0-26.0	5.6-7.3	0-5	---	---	---
	31-60	22-35	9.0-22.0	7.4-8.4	15-25	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
721B:								
Corliss---------	0-8	2-10	3.0-12.0	6.1-7.8	0-15	---	---	---
	8-19	0-10	1.0-6.0	6.1-7.8	0-15	---	---	---
	19-60	0-5	0.0-3.0	7.4-8.4	5-30	---	---	---
721C:								
Corliss---------	0-7	2-10	3.0-12.0	6.1-7.8	0-15	---	---	---
	7-28	0-10	1.0-6.0	6.1-7.8	0-15	---	---	---
	28-80	0-5	0.0-3.0	7.4-8.4	5-30	---	---	---
721D:								
Corliss---------	0-6	2-10	3.0-12.0	6.1-7.8	0-15	---	---	---
	6-20	0-10	1.0-6.0	6.1-7.8	0-15	---	---	---
	20-60	0-5	0.0-3.0	7.4-8.4	5-30	---	---	---
721E:								
Corliss---------	0-2	2-10	3.0-12.0	6.1-7.8	0-15	---	---	---
	2-22	0-10	1.0-6.0	6.1-7.8	0-15	---	---	---
	22-60	0-5	0.0-3.0	7.4-8.4	5-30	---	---	---
726:								
Kratka----------	0-8	5-15	6.0-20.0	6.1-7.3	---	---	---	---
	8-33	2-10	1.0-8.0	6.1-7.3	---	---	---	---
	33-60	10-35	4.0-21.0	6.1-7.3	---	---	---	---
746:								
Haslie----------	0-21	---	140-180	5.6-7.8	---	---	---	---
	21-24	---	140-190	5.6-7.8	---	---	---	---
	24-60	18-35	10.0-45.0	7.4-8.4	20-80	---	---	---
760C2:								
Chapett---------	0-7	10-20	8.0-20.0	6.1-7.3	---	---	---	---
	7-19	18-28	8.0-19.0	6.1-7.3	---	---	---	---
	19-27	10-18	4.0-12.0	7.4-8.4	15-30	---	---	---
	27-60	10-18	4.0-12.0	7.4-8.4	10-12	---	---	---
Sisseton--------	0-7	15-20	25.0-35.0	7.4-8.4	0-5	---	0-2	---
	7-22	10-18	20.0-30.0	7.4-8.4	15-35	---	0-2	0-1
	22-60	10-18	20.0-30.0	7.4-8.4	7-30	0-5	0-2	0-1
760D2:								
Chapett---------	0-7	10-20	8.0-20.0	6.1-7.3	---	---	---	---
	7-15	18-28	8.0-19.0	6.1-7.3	---	---	---	---
	15-23	10-18	4.0-12.0	7.4-8.4	15-30	---	---	---
	23-60	10-18	4.0-12.0	7.4-8.4	10-12	---	---	---
Sisseton--------	0-8	15-20	25.0-35.0	7.4-8.4	0-5	---	0-2	---
	8-16	10-18	20.0-30.0	7.4-8.4	15-35	---	0-2	0-1
	16-60	10-18	20.0-30.0	7.4-8.4	7-30	0-5	0-2	0-1
769B:								
Mehurin---------	0-13	27-35	25.0-30.0	6.1-7.3	---	---	0-2	---
	13-26	35-60	25.0-30.0	6.1-7.8	0-10	---	0-2	---
	26-34	20-35	20.0-25.0	7.4-8.4	10-25	0-10	0-2	---
	34-60	20-30	15.0-25.0	7.4-8.4	5-20	0-10	0-2	---
776B:								
Snellman--------	0-3	5-18	4.0-16.0	5.1-6.5	---	---	---	---
	3-12	5-15	3.0-14.0	5.1-6.5	---	---	---	---
	12-32	18-30	8.0-16.0	5.6-7.3	---	---	---	---
	32-60	7-18	3.0-10.0	7.4-8.4	15-25	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
776B:								
Sugarbush-------	0-3	5-15	4.0-12.0	5.6-7.3	---	---	---	---
	3-17	2-10	2.0-8.0	5.6-7.3	---	---	---	---
	17-28	10-18	5.0-10.0	5.6-7.3	---	---	---	---
	28-60	1-5	1.0-5.0	5.6-8.4	0-15	---	---	---
776C:								
Snellman--------	0-2	5-18	4.0-16.0	5.1-6.5	---	---	---	---
	2-16	5-15	3.0-14.0	5.1-6.5	---	---	---	---
	16-32	18-30	8.0-16.0	5.6-7.3	---	---	---	---
	32-60	7-18	3.0-10.0	7.4-8.4	15-25	---	---	---
Sugarbush-------	0-2	5-15	4.0-12.0	5.6-7.3	---	---	---	---
	2-14	2-10	2.0-8.0	5.6-7.3	---	---	---	---
	14-21	10-18	5.0-10.0	5.6-7.3	---	---	---	---
	21-60	1-5	1.0-5.0	5.6-8.4	0-15	---	---	---
776E:								
Snellman--------	0-3	5-18	4.0-16.0	5.1-6.5	---	---	---	---
	3-14	5-15	3.0-14.0	5.1-6.5	---	---	---	---
	14-26	18-30	8.0-16.0	5.6-7.3	---	---	---	---
	26-60	7-18	3.0-10.0	7.4-8.4	15-25	---	---	---
Sugarbush-------	0-2	5-15	4.0-12.0	5.6-7.3	---	---	---	---
	2-10	2-10	2.0-8.0	5.6-7.3	---	---	---	---
	10-19	10-18	5.0-10.0	5.6-7.3	---	---	---	---
	19-60	1-5	1.0-5.0	5.6-8.4	0-15	---	---	---
777C2:								
Sisseton--------	0-9	15-20	25.0-35.0	7.4-8.4	0-5	---	0-2	---
	9-19	10-18	20.0-30.0	7.4-8.4	15-35	---	0-2	0-1
	19-60	10-18	20.0-30.0	7.4-8.4	7-30	0-5	0-2	0-1
Heimdal---------	0-7	10-20	10.0-24.0	6.1-7.3	---	---	---	---
	7-17	10-18	5.0-12.0	6.1-7.8	0-10	---	---	---
	17-34	10-18	5.0-12.0	7.4-8.4	20-30	---	---	---
	34-60	7-18	4.0-10.0	7.4-8.4	15-25	---	---	---
777D2:								
Sisseton--------	0-8	15-20	25.0-35.0	7.4-8.4	0-5	---	0-2	---
	8-16	10-18	20.0-30.0	7.4-8.4	15-35	---	0-2	0-1
	16-60	10-18	20.0-30.0	7.4-8.4	7-30	0-5	0-2	0-1
Heimdal---------	0-8	10-20	10.0-24.0	6.1-7.3	---	---	---	---
	8-12	10-18	5.0-12.0	6.1-7.8	0-10	---	---	---
	12-25	10-18	5.0-12.0	7.4-8.4	20-30	---	---	---
	25-60	7-18	4.0-10.0	7.4-8.4	15-25	---	---	---
777E:								
Sisseton--------	0-3	15-20	25.0-35.0	7.4-8.4	0-5	---	0-2	---
	3-12	10-18	20.0-30.0	7.4-8.4	15-35	---	0-2	0-1
	12-60	10-18	20.0-30.0	7.4-8.4	7-30	0-5	0-2	0-1
Heimdal---------	0-8	10-20	10.0-24.0	6.1-7.3	---	---	---	---
	8-12	10-18	5.0-12.0	6.1-7.8	0-10	---	---	---
	12-19	10-18	5.0-12.0	7.4-8.4	20-30	---	---	---
	19-60	7-18	4.0-10.0	7.4-8.4	15-25	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
778B:								
Dorset----------	0-10	4-18	10.0-23.0	5.6-7.3	---	---	---	---
	10-20	10-18	7.0-17.0	5.6-7.3	---	---	---	---
	20-38	5-10	3.0-8.0	7.4-8.4	10-25	---	---	---
	38-60	0-5	0.0-5.0	7.4-8.4	5-15	---	---	---
Corliss---------	0-7	2-10	3.0-12.0	6.1-7.8	0-15	---	---	---
	7-16	0-10	1.0-6.0	6.1-7.8	0-15	---	---	---
	16-60	0-5	0.0-3.0	7.4-8.4	5-30	---	---	---
778C:								
Dorset----------	0-9	4-18	10.0-23.0	5.6-7.3	---	---	---	---
	9-16	10-18	7.0-17.0	5.6-7.3	---	---	---	---
	16-43	5-10	3.0-8.0	7.4-8.4	10-25	---	---	---
	43-60	0-5	0.0-5.0	7.4-8.4	5-15	---	---	---
Corliss---------	0-7	2-10	3.0-12.0	6.1-7.8	0-15	---	---	---
	7-11	0-10	1.0-6.0	6.1-7.8	0-15	---	---	---
	11-60	0-5	0.0-3.0	7.4-8.4	5-30	---	---	---
779B:								
Peever----------	0-11	27-35	25.0-30.0	6.1-7.3	---	---	0-2	---
	11-29	35-50	25.0-30.0	6.6-7.8	15-20	0-5	0-2	0-5
	29-60	30-45	15.0-25.0	7.4-8.4	10-15	0-10	0-8	0-10
Mehurin---------	0-13	27-35	25.0-30.0	6.1-7.3	---	---	0-2	---
	13-35	35-60	25.0-30.0	6.1-7.8	0-10	---	0-2	---
	35-48	20-35	20.0-25.0	7.4-8.4	10-25	0-10	0-2	---
	48-60	20-30	15.0-25.0	7.4-8.4	5-20	0-10	0-2	---
902B:								
Barnes----------	0-9	18-27	11.0-26.0	6.1-7.8	---	---	0-2	---
	9-17	18-27	8.0-18.0	6.1-7.8	0-5	---	0-2	---
	17-60	18-27	7.0-17.0	7.4-8.4	10-30	---	0-4	---
Buse----------	0-8	18-27	13.0-18.0	7.4-8.4	1-25	---	---	---
	8-40	18-27	10.0-15.0	7.4-8.4	15-40	---	---	---
	40-60	18-27	10.0-15.0	7.4-8.4	10-20	---	---	---
903C2:								
Barnes----------	0-10	18-27	11.0-26.0	6.1-7.8	---	---	0-2	---
	10-16	18-27	8.0-18.0	6.1-7.8	0-5	---	0-2	---
	16-60	18-27	7.0-17.0	7.4-8.4	10-30	---	0-4	---
Langhei---------	0-7	18-27	10.0-30.0	6.6-8.4	0-30	---	---	---
	7-30	18-32	10.0-25.0	7.9-8.4	20-35	---	---	---
	30-60	18-32	10.0-25.0	7.4-8.4	15-30	---	---	---
915C2:								
Forman----------	0-8	27-30	19.0-34.0	6.6-7.8	---	---	0-2	---
	8-23	30-35	13.0-23.0	6.6-7.8	---	---	0-2	---
	23-60	18-35	7.0-22.0	7.4-8.4	15-30	---	0-4	---
Buse----------	0-7	18-27	13.0-18.0	7.4-8.4	1-25	---	---	---
	7-30	18-27	10.0-15.0	7.4-8.4	15-40	---	---	---
	30-60	18-27	10.0-15.0	7.4-8.4	10-20	---	---	---
915D2:								
Forman----------	0-9	27-30	19.0-34.0	6.6-7.8	---	---	0-2	---
	9-23	30-35	13.0-23.0	6.6-7.8	---	---	0-2	---
	23-60	18-35	7.0-22.0	7.4-8.4	15-30	---	0-4	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
915D2:								
Buse----------	0-9	18-27	13.0-18.0	7.4-8.4	1-25	---	---	---
	9-16	18-27	10.0-15.0	7.4-8.4	15-40	---	---	---
	16-60	18-27	10.0-15.0	7.4-8.4	10-20	---	---	---
931C2:								
Formdale--------	0-8	27-35	17.0-28.0	6.1-7.3	---	---	---	---
	8-18	24-35	13.0-22.0	6.6-7.8	---	---	---	---
	18-39	18-35	9.0-18.0	7.4-8.4	20-30	---	---	---
	39-60	18-35	9.0-18.0	7.4-8.4	12-20	---	---	---
Langhei---------	0-7	28-35	10.0-30.0	6.6-8.4	0-30	---	---	---
	7-16	28-35	10.0-25.0	7.4-8.4	20-35	---	---	---
	16-60	28-35	10.0-25.0	7.4-8.4	15-30	---	---	---
931D2:								
Formdale--------	0-8	27-35	17.0-28.0	6.1-7.3	---	---	---	---
	8-12	24-35	13.0-22.0	6.6-7.8	---	---	---	---
	12-26	18-35	9.0-18.0	7.4-8.4	20-30	---	---	---
	26-60	18-35	9.0-18.0	7.4-8.4	12-20	---	---	---
Langhei---------	0-5	28-35	10.0-30.0	6.6-8.4	0-30	---	---	---
	5-21	28-35	10.0-25.0	7.4-8.4	20-35	---	---	---
	21-60	28-35	10.0-25.0	7.4-8.4	15-30	---	---	---
942D2:								
Langhei---------	0-7	18-27	10.0-30.0	6.6-8.4	0-30	---	---	---
	7-13	18-32	10.0-25.0	7.9-8.4	20-35	---	---	---
	13-60	18-32	10.0-25.0	7.4-8.4	15-30	---	---	---
Barnes----------	0-7	18-27	11.0-26.0	6.1-7.8	---	---	0-2	---
	7-14	18-27	8.0-18.0	6.1-7.8	0-5	---	0-2	---
	14-60	18-27	7.0-17.0	7.4-8.4	10-30	---	0-4	---
957B2:								
Rothsay---------	0-15	10-18	10.0-20.0	6.6-7.3	---	---	---	---
	15-27	10-18	6.0-12.0	6.6-7.8	---	---	---	---
	27-33	5-18	5.0-10.0	7.4-8.4	15-30	---	---	---
	33-60	5-18	5.0-10.0	7.4-8.4	10-20	---	---	---
Zell----------	0-9	10-18	15.0-25.0	6.6-8.4	0-5	---	0-2	---
	9-18	10-18	10.0-20.0	7.4-8.4	15-30	---	0-2	---
	18-60	5-18	10.0-20.0	7.4-9.0	10-25	0-1	0-2	0-3
969C2:								
Zell----------	0-8	10-18	15.0-25.0	6.6-8.4	0-5	---	0-2	---
	8-31	10-18	10.0-20.0	7.4-8.4	15-30	---	0-2	---
	31-60	5-18	10.0-20.0	7.4-9.0	10-25	0-1	0-2	0-3
Rothsay---------	0-9	10-18	10.0-20.0	6.6-7.3	---	---	---	---
	9-17	10-18	6.0-12.0	6.6-7.8	---	---	---	---
	17-28	5-18	5.0-10.0	7.4-8.4	15-30	---	---	---
	28-60	5-18	5.0-10.0	7.4-8.4	10-20	---	---	---
969D2:								
Zell----------	0-8	10-18	15.0-25.0	6.6-8.4	0-5	---	0-2	---
	8-13	10-18	10.0-20.0	7.4-8.4	15-30	---	0-2	---
	13-60	5-18	10.0-20.0	7.4-9.0	10-25	0-1	0-2	0-3
Rothsay---------	0-6	10-18	10.0-20.0	6.6-7.3	---	---	---	---
	6-12	10-18	6.0-12.0	6.6-7.8	---	---	---	---
	12-32	5-18	5.0-10.0	7.4-8.4	15-30	---	---	---
	32-60	5-18	5.0-10.0	7.4-8.4	10-20	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1015:								
Udipsamments----	0-14	1-15	1.0-5.0	6.6-7.3	---	---	---	---
	14-60	1-10	1.0-3.0	6.6-7.3	---	---	---	---
	60-80	1-10	1.0-3.0	7.4-8.4	0-5	---	---	---
1016:								
Udorthents------	0-60	---	---	---	---	---	---	---
	60-80	---	---	---	---	---	---	---
1027:								
Udorthents.								
1030:								
Pits.								
Udipsamments----	0-14	1-15	1.0-5.0	6.6-7.3	---	---	---	---
	14-60	1-10	1.0-3.0	6.6-7.3	---	---	---	---
	60-80	1-10	1.0-3.0	7.4-8.4	0-5	---	---	---
1077:								
Forada----------	0-16	10-22	14.0-45.0	6.6-7.8	0-15	---	---	---
	16-27	8-18	4.0-12.0	6.6-7.8	0-15	---	---	---
	27-60	0-5	0.0-5.0	7.4-8.4	5-30	---	---	---
Leafriver-------	0-12	---	100-180	4.5-7.3	---	---	---	---
	12-20	3-18	10.0-50.0	4.5-7.3	---	---	---	---
	20-60	0-10	1.0-15.0	4.5-7.3	---	---	---	---
1102B:								
Chapett---------	0-10	10-20	8.0-20.0	6.1-7.3	---	---	---	---
	10-25	18-28	8.0-19.0	6.1-7.3	---	---	---	---
	25-37	10-18	4.0-12.0	7.4-8.4	15-30	---	---	---
	37-60	10-18	4.0-12.0	7.4-8.4	10-12	---	---	---
Dorset----------	0-12	4-18	10.0-23.0	5.6-7.3	---	---	---	---
	12-15	10-18	7.0-17.0	5.6-7.3	---	---	---	---
	15-32	5-10	3.0-8.0	7.4-8.4	10-25	---	---	---
	32-60	0-5	0.0-5.0	7.4-8.4	5-15	---	---	---
1102C:								
Chapett---------	0-9	10-20	8.0-20.0	6.1-7.3	---	---	---	---
	9-20	18-28	8.0-19.0	6.1-7.3	---	---	---	---
	20-34	10-18	4.0-12.0	7.4-8.4	15-30	---	---	---
	34-60	10-18	4.0-12.0	7.4-8.4	10-12	---	---	---
Dorset----------	0-10	4-18	10.0-23.0	5.6-7.3	---	---	---	---
	10-18	10-18	7.0-17.0	5.6-7.3	---	---	---	---
	18-29	5-10	3.0-8.0	7.4-8.4	10-25	---	---	---
	29-60	0-5	0.0-5.0	7.4-8.4	5-15	---	---	---
1103:								
Clitherall------	0-10	8-15	8.0-20.0	5.6-7.3	---	---	---	---
	10-16	8-18	5.0-17.0	5.6-7.3	---	---	---	---
	16-38	1-5	1.0-4.0	6.1-7.8	0-12	---	---	---
	38-80	10-18	5.0-10.0	7.4-8.4	5-20	---	---	---
1104B:								
Waukon----------	0-9	12-27	9.0-28.0	6.1-7.3	---	---	---	---
	9-34	18-35	7.0-21.0	6.1-8.4	0-30	---	---	---
	34-60	18-30	7.0-18.0	7.4-8.4	5-30	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1104B:								
Dorset----------	0-9	4-18	10.0-23.0	5.6-7.3	---	---	---	---
	9-23	10-18	7.0-17.0	5.6-7.3	---	---	---	---
	23-33	5-10	3.0-8.0	7.4-8.4	10-25	---	---	---
	33-60	0-5	0.0-5.0	7.4-8.4	5-15	---	---	---
1104C:								
Waukon----------	0-9	12-27	9.0-28.0	6.1-7.3	---	---	---	---
	9-28	18-35	7.0-21.0	6.1-8.4	0-30	---	---	---
	28-60	18-30	7.0-18.0	7.4-8.4	5-30	---	---	---
Dorset----------	0-10	4-18	10.0-23.0	5.6-7.3	---	---	---	---
	10-14	10-18	7.0-17.0	5.6-7.3	---	---	---	---
	14-20	5-10	3.0-8.0	7.4-8.4	10-25	---	---	---
	20-60	0-5	0.0-5.0	7.4-8.4	5-15	---	---	---
1104D:								
Waukon----------	0-9	12-27	9.0-28.0	6.1-7.3	---	---	---	---
	9-21	18-35	7.0-21.0	6.1-8.4	0-30	---	---	---
	21-60	18-30	7.0-18.0	7.4-8.4	5-30	---	---	---
Dorset----------	0-8	4-18	10.0-23.0	5.6-7.3	---	---	---	---
	8-18	10-18	7.0-17.0	5.6-7.3	---	---	---	---
	18-60	0-5	0.0-5.0	7.4-8.4	5-15	---	---	---
1105B:								
Dent----------	0-12	8-22	8.0-23.0	6.1-7.3	---	---	---	---
	12-26	18-35	10.0-20.0	5.1-7.3	---	---	---	---
	26-54	8-27	4.0-15.0	7.4-7.8	10-20	---	---	---
	54-80	5-20	3.0-11.0	7.4-8.4	5-15	---	---	---
1110:								
Isan----------	0-16	5-14	10.0-25.0	5.6-7.3	---	---	---	---
	16-26	2-8	2.0-10.0	5.1-6.5	---	---	---	---
	26-60	1-5	1.0-5.0	5.6-7.3	---	---	---	---
1111:								
Nidaros---------	0-32	---	110-170	4.5-7.8	---	---	---	---
	32-38	8-35	13.0-51.0	5.6-8.4	---	---	---	---
	38-60	0-4	1.0-3.0	5.6-8.4	0-5	---	---	---
1112D:								
Chapett---------	0-8	10-20	8.0-20.0	6.1-7.3	---	---	---	---
	8-18	18-28	8.0-19.0	6.1-7.3	---	---	---	---
	18-30	10-18	4.0-12.0	7.4-8.4	15-30	---	---	---
	30-60	10-18	4.0-12.0	7.4-8.4	10-12	---	---	---
Corliss---------	0-6	2-10	3.0-12.0	6.1-7.8	0-15	---	---	---
	6-18	0-10	1.0-6.0	6.1-7.8	0-15	---	---	---
	18-60	0-5	0.0-3.0	7.4-8.4	5-30	---	---	---
1112E:								
Chapett---------	0-7	10-20	8.0-20.0	6.1-7.3	---	---	---	---
	7-20	18-28	8.0-19.0	6.1-7.3	---	---	---	---
	20-37	10-18	4.0-12.0	7.4-8.4	15-30	---	---	---
	37-60	10-18	4.0-12.0	7.4-8.4	10-12	---	---	---
Corliss---------	0-7	2-10	3.0-12.0	6.1-7.8	0-15	---	---	---
	7-10	0-10	1.0-6.0	6.1-7.8	0-15	---	---	---
	10-60	0-5	0.0-3.0	7.4-8.4	5-30	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1113:								
Haslie----------	0-44	---	140-180	5.6-7.8	---	---	---	---
	44-60	18-35	10.0-45.0	7.4-8.4	60-80	---	---	---
Seelyeville-----	0-30	---	140-200	4.5-7.3	---	---	---	---
	30-60	---	140-200	4.5-7.3	---	---	---	---
Cathro----------	0-30	---	150-230	4.5-7.8	---	---	---	---
	30-60	10-30	2.0-20.0	5.6-8.4	5-25	---	---	---
1114:								
Hangaard--------	0-8	5-15	10.0-20.0	6.6-7.8	---	---	---	---
	8-60	2-10	2.0-6.0	7.4-8.4	5-15	---	---	---
1120:								
Rushlake--------	0-5	3-10	2.0-12.0	6.1-7.8	0-15	---	---	---
	5-60	1-10	1.0-6.0	7.4-8.4	5-30	---	---	---
Hangaard--------	0-4	5-15	10.0-20.0	6.6-7.8	---	---	---	---
	4-60	2-10	2.0-6.0	7.4-8.4	5-15	---	---	---
1129:								
Lindaas---------	0-15	27-35	24.0-42.0	6.6-7.3	---	---	---	---
	15-25	35-60	25.0-54.0	6.6-7.3	---	---	---	---
	25-60	25-40	16.0-34.0	7.4-8.4	20-30	---	---	---
1131B:								
Verndale--------	0-9	7-12	7.0-15.0	5.6-7.3	---	---	---	---
	9-19	7-18	3.0-12.0	5.6-7.3	---	---	---	---
	19-49	2-6	2.0-4.0	5.6-7.3	---	---	---	---
	49-60	0-4	0.0-3.0	6.1-8.4	0-30	---	---	---
Abbeylake-------	0-8	2-10	3.0-15.0	6.1-7.3	0-15	---	---	---
	8-19	0-10	1.0-8.0	6.1-7.3	0-15	---	---	---
	19-60	0-3	1.0-5.0	7.4-8.4	5-30	---	---	---
1136:								
Nidaros---------	0-27	---	110-170	4.5-7.8	---	---	---	---
	27-38	8-35	13.0-51.0	5.6-8.4	---	---	---	---
	38-60	0-4	1.0-3.0	5.6-8.4	0-5	---	---	---
1149:								
Hamerly---------	0-16	27-35	20.0-35.0	6.6-8.4	1-15	---	0-2	---
	16-25	18-35	10.0-30.0	7.4-8.4	15-35	0-3	0-4	0-2
	25-60	18-35	10.0-25.0	7.4-8.4	10-30	0-3	0-4	0-2
1195A:								
Sybil----------	0-6	3-10	3.0-10.0	5.6-7.3	---	---	---	---
	6-14	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	14-19	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	19-34	3-10	1.0-7.0	5.6-7.3	---	---	---	---
	34-80	2-5	1.0-4.0	6.1-8.4	0-3	---	---	---
Eagleview-------	0-8	2-10	10.0-15.0	5.6-7.3	---	---	---	---
	8-32	2-10	10.0-15.0	5.6-7.3	---	---	---	---
	32-60	2-10	5.0-10.0	6.1-7.3	---	---	---	---
	60-80	2-10	0.0-5.0	6.1-8.4	0-10	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1195B:								
Sybil----------	0-5	3-10	3.0-10.0	5.6-7.3	---	---	---	---
	5-10	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	10-15	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	15-32	3-10	1.0-7.0	5.6-7.3	---	---	---	---
	32-80	2-5	1.0-4.0	6.1-8.4	0-3	---	---	---
Eagleview-------	0-4	2-10	10.0-15.0	5.6-7.3	---	---	---	---
	4-36	2-10	10.0-15.0	5.6-7.3	---	---	---	---
	36-60	2-10	5.0-10.0	6.1-7.3	---	---	---	---
1195C:								
Sybil----------	0-8	3-10	3.0-10.0	5.6-7.3	---	---	---	---
	8-17	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	17-26	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	26-37	3-10	1.0-7.0	5.6-7.3	---	---	---	---
	37-80	2-5	1.0-4.0	6.1-8.4	0-3	---	---	---
Eagleview-------	0-3	2-10	10.0-15.0	5.6-7.3	---	---	---	---
	3-37	2-10	10.0-15.0	5.6-7.3	---	---	---	---
	37-60	2-10	5.0-10.0	6.1-7.3	---	---	---	---
	60-80	2-10	0.0-5.0	6.1-8.4	0-10	---	---	---
1195E:								
Sybil----------	0-4	5-18	6.0-19.0	5.6-7.3	---	---	---	---
	4-15	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	15-25	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	25-78	3-10	1.0-7.0	5.6-7.3	---	---	---	---
	78-80	2-5	1.0-4.0	6.1-8.4	0-3	---	---	---
Eagleview-------	0-7	2-10	10.0-15.0	5.6-7.3	---	---	---	---
	7-17	2-10	10.0-15.0	5.6-7.3	---	---	---	---
	17-55	2-10	5.0-10.0	6.1-7.3	---	---	---	---
	55-80	2-10	0.0-5.0	6.1-8.4	0-10	---	---	---
1196B:								
Lida----------	0-9	5-18	6.0-19.0	5.6-7.3	---	---	---	---
	9-13	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	13-25	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	25-45	1-5	1.0-4.0	5.6-7.3	---	---	---	---
	45-60	1-5	1.0-4.0	7.4-8.4	3-15	---	---	---
Two Inlets------	0-7	5-10	3.0-10.0	5.6-7.3	---	---	---	---
	7-14	2-10	1.0-6.0	5.6-7.3	---	---	---	---
	14-29	5-15	2.0-9.0	6.1-7.3	---	---	---	---
	29-60	0-3	0.0-2.0	7.4-8.4	5-30	---	---	---
1196C:								
Lida----------	0-8	5-18	6.0-19.0	5.6-7.3	---	---	---	---
	8-17	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	17-25	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	25-41	1-5	1.0-4.0	5.6-7.3	---	---	---	---
	41-80	1-5	1.0-4.0	7.4-8.4	3-15	---	---	---
Two Inlets------	0-4	5-10	3.0-10.0	5.6-7.3	---	---	---	---
	4-9	2-10	1.0-6.0	5.6-7.3	---	---	---	---
	9-38	5-15	2.0-9.0	6.1-7.3	---	---	---	---
	38-60	0-3	0.0-2.0	7.4-8.4	5-30	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1196E:								
Lida----------	0-3	5-18	6.0-19.0	5.6-7.3	---	---	---	---
	3-14	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	14-20	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	20-27	1-5	1.0-4.0	5.6-7.3	---	---	---	---
	27-60	1-5	1.0-4.0	7.4-8.4	3-15	---	---	---
Two Inlets------	0-3	5-10	3.0-10.0	5.6-7.3	---	---	---	---
	3-7	2-10	1.0-6.0	5.6-7.3	---	---	---	---
	7-21	5-15	2.0-9.0	6.1-7.3	---	---	---	---
	21-60	0-3	0.0-2.0	7.4-8.4	5-30	---	---	---
1196F:								
Lida----------	0-4	5-18	6.0-19.0	5.6-7.3	---	---	---	---
	4-17	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	17-25	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	25-28	1-5	1.0-4.0	5.6-7.3	---	---	---	---
	28-60	1-5	1.0-4.0	7.4-8.4	3-15	---	---	---
Two Inlets------	0-3	5-10	3.0-10.0	5.6-7.3	---	---	---	---
	3-7	2-10	1.0-6.0	5.6-7.3	---	---	---	---
	7-14	5-15	2.0-9.0	6.1-7.3	---	---	---	---
	14-60	0-3	0.0-2.0	7.4-8.4	5-30	---	---	---
1200:								
Egglake---------	0-4	8-15	7.0-17.0	5.6-7.3	---	---	---	---
	4-9	3-10	2.0-10.0	5.6-7.3	---	---	---	---
	9-25	18-30	7.0-18.0	5.6-7.3	---	---	---	---
	25-60	10-18	4.0-11.0	7.4-8.4	10-20	---	---	---
1208B:								
Naytahwaush-----	0-7	27-35	15.0-33.0	5.6-7.3	---	---	---	---
	7-25	35-60	15.0-26.0	5.6-7.3	0-5	---	---	---
	25-60	22-35	9.0-22.0	7.4-8.4	15-25	---	---	---
Mahkonce--------	0-7	22-35	15.0-30.0	5.6-7.3	---	---	---	---
	7-37	35-60	25.0-30.0	6.1-7.3	---	---	---	---
	37-55	30-45	10.0-20.0	6.1-7.8	5-15	---	---	---
	55-60	25-35	10.0-20.0	7.4-8.4	15-30	---	---	---
1209C:								
Naytahwaush-----	0-7	27-35	15.0-33.0	5.6-7.3	---	---	---	---
	7-24	35-60	15.0-26.0	5.6-7.3	0-5	---	---	---
	24-60	22-35	9.0-22.0	7.4-8.4	15-25	---	---	---
1212B:								
Mahkonce--------	0-7	22-35	15.0-30.0	5.6-7.3	---	---	---	---
	7-23	35-60	25.0-30.0	6.1-7.3	---	---	---	---
	23-46	30-45	10.0-20.0	6.1-7.8	5-15	---	---	---
	46-60	25-35	10.0-20.0	7.4-8.4	15-30	---	---	---
1214:								
Mustinka--------	0-14	28-40	28.0-40.0	6.6-7.3	---	---	---	---
	14-24	35-60	20.0-35.0	6.6-7.3	---	---	---	---
	24-36	18-35	10.0-18.0	7.4-8.4	10-30	---	---	---
	36-80	18-35	10.0-18.0	7.4-8.4	10-30	---	---	---
1215:								
Pinelake--------	0-12	8-15	12.0-24.0	6.1-7.3	---	---	---	---
	12-30	12-18	7.0-13.0	6.1-7.3	---	---	---	---
	30-35	1-8	1.0-5.0	6.1-8.4	---	---	---	---
	35-80	1-5	1.0-4.0	7.4-8.4	3-10	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1216B:								
Egglake---------	0-4	5-15	6.0-17.0	5.6-7.3	---	---	---	---
	4-8	3-10	2.0-10.0	5.6-7.3	---	---	---	---
	8-22	18-30	7.0-18.0	5.6-7.3	---	---	---	---
	22-60	10-18	4.0-11.0	7.4-8.4	10-20	---	---	---
Wykeham---------	0-9	5-18	6.0-23.0	5.1-6.5	---	---	---	---
	9-13	5-15	4.0-13.0	5.1-6.5	---	---	---	---
	13-40	18-30	8.0-20.0	5.6-7.3	---	---	---	---
	40-60	10-18	4.0-12.0	7.4-8.4	10-25	---	---	---
1217E:								
Waukon----------	0-8	12-27	9.0-28.0	6.1-7.3	---	---	---	---
	8-36	18-35	7.0-21.0	6.1-8.4	0-30	---	---	---
	36-60	18-30	7.0-18.0	7.4-8.4	5-30	---	---	---
Lida----------	0-6	5-18	6.0-19.0	5.6-7.3	---	---	---	---
	6-16	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	16-36	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	36-60	1-5	1.0-4.0	7.4-8.4	3-15	---	---	---
1218B:								
Snellman--------	0-3	5-18	4.0-16.0	5.1-6.5	---	---	---	---
	3-10	5-15	3.0-14.0	5.1-6.5	---	---	---	---
	10-42	18-30	8.0-16.0	5.6-7.3	---	---	---	---
	42-55	7-18	3.0-10.0	7.4-8.4	15-25	---	---	---
	55-80	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---
Lida----------	0-5	5-18	6.0-19.0	5.6-7.3	---	---	---	---
	5-19	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	19-31	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	31-35	1-5	1.0-4.0	5.6-7.3	---	---	---	---
	35-80	1-5	1.0-4.0	7.4-8.4	3-15	---	---	---
1218C:								
Snellman--------	0-3	5-18	4.0-16.0	5.1-6.5	---	---	---	---
	3-10	5-15	3.0-14.0	5.1-6.5	---	---	---	---
	10-39	18-30	8.0-16.0	5.6-7.3	---	---	---	---
	39-80	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---
Lida----------	0-6	5-18	6.0-19.0	5.6-7.3	---	---	---	---
	6-13	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	13-20	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	20-80	1-5	1.0-4.0	7.4-8.4	3-15	---	---	---
1218E:								
Snellman--------	0-3	5-18	4.0-16.0	5.1-6.5	---	---	---	---
	3-8	5-15	3.0-14.0	5.1-6.5	---	---	---	---
	8-30	18-30	8.0-16.0	5.6-7.3	---	---	---	---
	30-60	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---
Lida----------	0-6	5-18	6.0-19.0	5.6-7.3	---	---	---	---
	6-13	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	13-28	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	28-42	1-5	1.0-4.0	5.6-7.3	---	---	---	---
	42-60	1-5	1.0-4.0	7.4-8.4	3-15	---	---	---
1218F:								
Snellman--------	0-3	5-18	4.0-16.0	5.1-6.5	---	---	---	---
	3-13	5-15	3.0-14.0	5.1-6.5	---	---	---	---
	13-23	18-30	8.0-16.0	5.6-7.3	---	---	---	---
	23-40	7-18	3.0-10.0	7.4-8.4	15-25	---	---	---
	40-60	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1218F:								
Lida----------	0-4	5-18	6.0-19.0	5.6-7.3	---	---	---	---
	4-14	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	14-24	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	24-35	1-5	1.0-4.0	5.6-7.3	---	---	---	---
	35-60	1-5	1.0-4.0	7.4-8.4	3-15	---	---	---
1219C:								
Sandberg--------	0-8	5-15	4.0-16.0	5.6-7.8	0-5	---	---	---
	8-25	0-10	1.0-6.0	6.1-7.8	0-5	---	---	---
	25-36	0-5	1.0-6.0	7.4-8.4	10-25	---	---	---
	36-60	0-5	1.0-4.0	7.4-8.4	5-10	---	---	---
Sverdrup--------	0-12	10-18	9.0-17.0	6.1-7.3	---	---	---	---
	12-24	6-18	4.0-13.0	6.1-7.8	---	---	---	---
	24-60	0-10	0.0-6.0	7.4-8.4	---	---	---	---
1221B:								
Sverdrup--------	0-15	10-18	9.0-17.0	6.1-7.3	---	---	---	---
	15-28	6-18	4.0-13.0	6.1-7.8	---	---	---	---
	28-60	0-10	0.0-6.0	7.4-8.4	---	---	---	---
Sandberg--------	0-8	5-15	4.0-16.0	5.6-7.8	0-5	---	---	---
	8-14	0-10	1.0-6.0	6.1-7.8	0-5	---	---	---
	14-24	0-5	1.0-6.0	7.4-8.4	10-25	---	---	---
	24-60	0-5	1.0-4.0	7.4-8.4	5-10	---	---	---
1223D:								
Sandberg--------	0-7	5-15	4.0-16.0	5.6-7.8	0-5	---	---	---
	7-13	0-10	1.0-6.0	6.1-7.8	0-5	---	---	---
	13-60	0-5	1.0-4.0	7.4-8.4	5-10	---	---	---
Arvilla---------	0-10	6-18	5.0-20.0	6.1-8.4	---	---	---	---
	10-19	6-18	5.0-15.0	6.6-8.4	---	---	---	---
	19-60	2-10	1.0-5.0	7.4-8.4	1-5	---	---	---
1227:								
Quam----------	0-33	22-27	20.0-40.0	6.6-7.8	---	---	---	---
	33-50	22-35	20.0-40.0	6.6-7.8	0-15	---	---	---
	50-60	20-35	12.0-25.0	7.4-8.4	5-20	---	---	---
Cathro----------	0-12	---	150-230	4.5-7.8	---	---	---	---
	12-24	---	150-230	4.5-7.8	---	---	---	---
	24-60	10-30	2.0-20.0	5.6-8.4	5-25	---	---	---
Urness----------	0-20	18-27	40.0-50.0	7.4-8.4	5-30	---	---	---
	20-45	18-35	40.0-50.0	7.4-8.4	5-30	---	---	---
	45-60	18-35	40.0-50.0	7.4-8.4	5-30	---	---	---
1230:								
Haslie----------	0-44	---	140-180	5.6-7.8	---	---	---	---
	44-60	18-35	10.0-45.0	7.4-8.4	60-80	---	---	---
Nidaros---------	0-38	---	110-170	4.5-7.8	---	---	---	---
	38-54	8-35	13.0-51.0	5.6-8.4	---	---	---	---
	54-60	0-4	1.0-3.0	5.6-8.4	0-5	---	---	---
1232B:								
Chapett---------	0-8	10-20	8.0-20.0	6.1-7.3	---	---	---	---
	8-21	18-28	8.0-19.0	6.1-7.3	---	---	---	---
	21-36	10-18	4.0-12.0	7.4-8.4	15-30	---	---	---
	36-60	10-18	4.0-12.0	7.4-8.4	10-12	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1232E:								
Chapett---------	0-9	10-20	8.0-20.0	6.1-7.3	---	---	---	---
	9-26	18-28	8.0-19.0	6.1-7.3	---	---	---	---
	26-33	10-18	4.0-12.0	7.4-8.4	15-30	---	---	---
	33-60	10-18	4.0-12.0	7.4-8.4	10-12	---	---	---
1234B:								
Formdale--------	0-11	27-35	17.0-28.0	6.1-7.3	---	---	---	---
	11-18	24-35	13.0-22.0	6.6-7.8	---	---	---	---
	18-30	18-35	9.0-18.0	7.4-8.4	20-30	---	---	---
	30-60	18-35	9.0-18.0	7.4-8.4	12-20	---	---	---
Buse----------	0-8	27-35	15.0-24.0	6.6-8.4	1-25	---	---	---
	8-27	18-35	10.0-20.0	7.4-8.4	15-40	---	---	---
	27-60	18-35	9.0-18.0	7.4-8.4	10-20	---	---	---
1237:								
Lakepark--------	0-9	20-27	20.0-30.0	6.1-7.8	---	---	---	---
	9-35	20-35	14.0-28.0	6.1-7.8	---	---	---	---
	35-44	22-35	12.0-22.0	6.6-7.8	---	---	---	---
	44-60	22-35	11.0-19.0	7.4-8.4	5-20	---	---	---
1239:								
Quam----------	0-9	22-27	20.0-40.0	6.6-7.8	---	---	---	---
	9-56	22-35	20.0-40.0	6.6-7.8	0-15	---	---	---
	56-80	20-35	12.0-25.0	7.4-8.4	5-20	---	---	---
1240:								
Roliss----------	0-14	28-35	20.0-32.0	6.6-8.4	5-20	---	---	---
	14-17	18-35	10.0-18.0	7.4-8.4	5-20	0-3	---	---
	17-27	18-35	8.0-16.0	7.4-8.4	20-35	0-3	---	---
	27-60	18-35	8.0-16.0	7.4-8.4	12-25	0-3	---	---
1247D:								
Corliss---------	0-7	2-10	3.0-12.0	6.1-7.8	0-15	---	---	---
	7-10	0-10	1.0-6.0	6.1-7.8	0-15	---	---	---
	10-60	0-5	0.0-3.0	7.4-8.4	5-30	---	---	---
Dorset----------	0-8	4-18	10.0-23.0	5.6-7.3	---	---	---	---
	8-17	10-18	7.0-17.0	5.6-7.3	---	---	---	---
	17-22	5-10	3.0-8.0	7.4-8.4	10-25	---	---	---
	22-60	0-5	0.0-5.0	7.4-8.4	5-15	---	---	---
1250C:								
Abbeylake-------	0-8	2-10	3.0-15.0	6.1-7.3	0-15	---	---	---
	8-18	0-10	1.0-8.0	6.1-7.3	0-15	---	---	---
	18-60	0-3	1.0-5.0	7.4-8.4	5-30	---	---	---
Verndale--------	0-9	7-12	7.0-15.0	5.6-7.3	---	---	---	---
	9-17	7-18	3.0-12.0	5.6-7.3	---	---	---	---
	17-24	2-6	2.0-4.0	5.6-7.3	---	---	---	---
	24-60	0-4	0.0-3.0	6.1-8.4	0-30	---	---	---
1259:								
Hamerly---------	0-8	27-35	20.0-35.0	6.6-8.4	1-15	---	0-2	---
	8-40	18-35	10.0-30.0	7.4-8.4	15-35	0-3	0-4	0-2
	40-60	18-35	10.0-25.0	7.4-8.4	10-30	0-3	0-4	0-2
Mustinka--------	0-8	28-40	28.0-40.0	6.6-7.3	---	---	---	---
	8-25	35-60	20.0-35.0	6.6-7.3	---	---	---	---
	25-36	18-35	10.0-18.0	7.4-8.4	10-30	---	---	---
	36-60	18-35	10.0-18.0	7.4-8.4	10-30	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1275B:								
Kandota---------	0-9	10-20	8.0-20.0	5.6-7.3	---	---	---	---
	9-11	5-18	3.0-13.0	5.1-6.5	---	---	---	---
	11-45	18-30	7.0-19.0	5.6-7.3	---	---	---	---
	45-57	12-18	5.0-12.0	7.4-8.4	15-25	---	---	---
	57-80	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---
Egglake---------	0-6	8-14	7.0-17.0	6.1-7.3	---	---	---	---
	6-12	5-12	2.0-10.0	5.6-7.3	---	---	---	---
	12-17	12-20	7.0-18.0	5.6-6.5	---	---	---	---
	17-52	18-30	7.0-18.0	5.6-6.5	---	---	---	---
	52-80	10-18	4.0-11.0	6.6-7.8	0-20	---	---	---
1275C:								
Kandota---------	0-9	10-20	8.0-20.0	5.6-7.3	---	---	---	---
	9-13	5-18	3.0-13.0	5.1-6.5	---	---	---	---
	13-38	18-30	7.0-19.0	5.6-7.3	---	---	---	---
	38-55	12-18	5.0-12.0	7.4-8.4	15-25	---	---	---
	55-80	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---
Egglake---------	0-9	8-14	7.0-17.0	6.1-7.3	---	---	---	---
	9-14	5-12	2.0-10.0	5.6-7.3	---	---	---	---
	14-22	12-20	7.0-18.0	5.6-6.5	---	---	---	---
	22-41	18-30	7.0-18.0	5.6-6.5	---	---	---	---
	41-80	10-18	4.0-11.0	6.6-7.8	0-20	---	---	---
1276:								
Knute----------	0-10	10-18	8.0-18.0	6.1-7.3	---	---	---	---
	10-12	18-28	8.0-19.0	6.1-7.8	---	---	---	---
	12-34	10-18	4.0-12.0	7.4-8.4	20-30	---	---	---
	34-48	10-18	4.0-12.0	7.4-8.4	15-25	---	---	---
	48-60	10-18	3.0-10.0	7.4-8.4	5-15	---	---	---
Brandsvold------	0-11	10-20	7.0-15.0	6.1-7.3	---	---	---	---
	11-15	10-20	9.0-13.0	5.6-7.3	---	---	---	---
	15-29	18-27	9.0-13.0	5.6-6.5	---	---	---	---
	29-60	12-20	5.0-10.0	6.1-7.3	---	---	---	---
1277D:								
Corliss---------	0-8	2-10	3.0-12.0	6.1-7.8	0-15	---	---	---
	8-20	0-10	1.0-6.0	6.1-7.8	0-15	---	---	---
	20-60	0-5	0.0-3.0	7.4-8.4	5-30	---	---	---
Sverdrup--------	0-9	10-18	9.0-17.0	6.1-7.3	---	---	---	---
	9-25	6-18	4.0-13.0	6.1-7.8	---	---	---	---
	25-60	0-10	0.0-6.0	7.4-8.4	---	---	---	---
1289:								
Knute----------	0-10	10-18	8.0-18.0	6.1-7.3	---	---	---	---
	10-13	18-28	8.0-19.0	5.1-6.5	---	---	---	---
	13-41	12-20	4.0-12.0	5.6-6.5	---	---	---	---
	41-53	10-18	4.0-12.0	7.4-8.4	15-25	---	---	---
	53-60	10-18	3.0-10.0	7.4-8.4	5-15	---	---	---
1290:								
Brandsvold------	0-12	10-20	7.0-15.0	6.1-7.3	---	---	---	---
	12-17	10-20	9.0-13.0	5.6-7.3	---	---	---	---
	17-37	18-27	9.0-13.0	5.6-6.5	---	---	---	---
	37-45	12-20	5.0-10.0	6.1-7.3	---	---	---	---
	45-80	10-18	5.0-10.0	7.4-8.4	15-25	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1291:								
Sedgeville------	0-8	0-23	10.0-45.0	6.1-8.4	0-20	---	---	---
	8-34	8-17	5.0-20.0	6.1-8.4	0-20	---	---	---
	34-60	2-5	2.0-5.0	6.6-8.4	0-20	---	---	---
1293:								
Sedgeville------	0-21	8-15	10.0-35.0	5.6-7.8	0-20	---	---	---
	21-40	8-17	5.0-20.0	5.6-7.8	0-20	---	---	---
	40-60	2-5	2.0-5.0	7.9-8.4	5-20	---	---	---
1304A:								
Glyndon---------	0-16	15-20	12.0-24.0	7.4-9.0	5-25	---	0-4	---
	16-29	10-18	6.0-14.0	7.4-9.0	20-40	---	0-4	---
	29-60	5-18	2.0-10.0	7.4-9.0	10-35	---	0-4	---
1307:								
Rushlake--------	0-5	1-5	2.0-9.0	6.1-7.8	0-15	---	---	---
	5-60	1-10	1.0-6.0	7.4-8.4	5-30	---	---	---
1317:								
Vallers---------	0-14	28-35	15.0-28.0	7.4-8.4	5-25	---	0-4	---
	14-24	18-35	10.0-18.0	7.4-8.4	20-35	0-2	0-4	---
	24-60	18-35	8.0-16.0	7.4-8.4	12-25	0-2	0-4	---
1319B:								
Rockwood--------	0-8	5-15	---	5.1-6.5	---	---	---	---
	8-18	5-10	---	5.1-6.5	---	---	---	---
	18-26	8-18	---	5.6-7.3	---	---	---	---
	26-42	8-18	---	5.6-7.3	---	---	---	---
	42-60	7-15	---	6.1-8.4	---	---	---	---
1319C:								
Rockwood--------	0-9	5-15	---	5.1-6.5	---	---	---	---
	9-16	5-10	---	5.1-6.5	---	---	---	---
	16-27	8-18	---	5.6-7.3	---	---	---	---
	27-41	8-18	---	5.6-7.3	---	---	---	---
	41-60	7-15	---	6.1-8.4	---	---	---	---
1319D:								
Rockwood--------	0-5	5-15	---	5.1-6.5	---	---	---	---
	5-9	5-10	---	5.1-6.5	---	---	---	---
	9-38	8-18	---	5.6-7.3	---	---	---	---
	38-45	8-18	---	5.6-7.3	---	---	---	---
	45-60	7-15	---	6.1-8.4	---	---	---	---
1320B:								
Blowers---------	0-7	5-15	6.0-20.0	5.1-7.3	---	---	---	---
	7-19	5-10	4.0-9.0	5.1-6.5	---	---	---	---
	19-36	8-18	5.0-11.0	5.6-7.3	---	---	---	---
	36-43	8-18	4.0-10.0	5.6-7.3	0-15	---	---	---
	43-60	7-15	4.0-9.0	6.6-8.4	0-15	---	---	---
1321:								
Paddock---------	0-8	8-15	8.0-20.0	5.6-7.3	---	---	---	---
	8-15	3-10	3.0-9.0	5.6-6.5	---	---	---	---
	15-40	8-18	4.0-10.0	6.6-7.3	---	---	---	---
	40-60	6-15	3.0-9.0	6.6-8.4	---	---	---	---
Becida----------	0-8	10-20	11.0-24.0	5.6-7.3	---	---	---	---
	8-13	3-10	3.0-11.0	5.6-6.5	---	---	---	---
	13-27	8-18	9.0-11.0	5.1-6.5	---	---	---	---
	27-58	8-18	3.0-9.0	5.1-6.5	---	---	---	---
	58-80	6-15	3.0-9.0	6.6-8.4	---	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1322:								
Wolverton-------	0-16	10-20	20.0-40.0	7.4-8.4	15-25	---	---	---
	16-34	5-15	20.0-40.0	7.4-8.4	15-25	---	---	---
	34-45	2-10	15.0-30.0	7.4-8.4	10-20	---	---	---
	45-80	18-35	10.0-20.0	7.4-8.4	10-20	---	---	---
1324B:								
Heimdal---------	0-8	10-20	10.0-24.0	6.1-7.3	---	---	---	---
	8-18	10-18	5.0-12.0	6.1-7.8	0-10	---	---	---
	18-25	10-18	5.0-12.0	7.4-8.4	20-30	---	---	---
	25-60	7-18	4.0-10.0	7.4-8.4	15-25	---	---	---
Sisseton--------	0-8	15-20	25.0-35.0	7.4-8.4	0-5	---	0-2	---
	8-22	10-18	20.0-30.0	7.4-8.4	15-35	---	0-2	0-1
	22-60	10-18	20.0-30.0	7.4-8.4	7-30	0-5	0-2	0-1
1338:								
Oakcreek--------	0-14	8-15	10.0-20.0	6.1-7.3	---	---	---	---
	14-33	10-18	6.0-11.0	5.6-7.3	---	---	---	---
	33-47	2-8	1.0-5.0	5.6-7.8	5-20	---	---	---
	47-80	2-4	1.0-3.0	7.4-8.4	5-15	---	---	---
1339:								
Borup----------	0-10	15-27	18.0-43.0	7.4-8.4	5-20	---	0-4	---
	10-16	10-18	8.0-15.0	7.4-8.4	15-40	0-5	0-4	---
	16-60	5-18	4.0-14.0	7.4-8.4	10-20	0-5	2-8	---
1340:								
Bluffcreek------	0-8	5-14	6.0-18.0	5.6-7.3	---	---	---	---
	8-31	8-18	3.0-12.0	5.6-7.3	---	---	---	---
	31-60	1-5	0.0-4.0	6.1-8.4	0-30	---	---	---
Epoufette-------	0-7	5-15	10.0-20.0	6.1-7.3	---	---	---	---
	7-10	5-15	4.0-14.0	6.1-7.3	0-5	---	---	---
	10-22	8-18	4.0-10.0	6.6-7.8	0-10	---	---	---
	22-60	0-8	1.0-5.0	7.4-8.4	5-10	---	---	---
1341:								
Clitherall------	0-11	8-15	8.0-20.0	5.6-7.3	---	---	---	---
	11-16	8-18	5.0-17.0	5.6-7.3	---	---	---	---
	16-30	4-10	2.0-6.0	5.6-7.3	---	---	---	---
	30-45	1-5	1.0-4.0	6.1-7.8	0-12	---	---	---
	45-80	10-18	5.0-10.0	7.4-8.4	5-20	---	---	---
Wykeham---------	0-8	5-18	6.0-23.0	5.1-6.5	---	---	---	---
	8-17	5-15	4.0-13.0	5.1-6.5	---	---	---	---
	17-32	18-30	8.0-20.0	5.6-7.3	---	---	---	---
	32-60	10-18	4.0-12.0	7.4-8.4	10-25	---	---	---
1342:								
Pinelake--------	0-10	8-18	10.0-23.0	6.1-7.3	---	---	---	---
	10-29	12-18	12.0-18.0	6.1-7.3	---	---	---	---
	29-70	1-5	1.0-5.0	7.4-8.4	2-20	---	---	---
	70-80	12-27	12.0-27.0	7.4-8.4	5-15	---	---	---
Brandsvold------	0-10	10-20	7.0-15.0	6.1-7.3	---	---	---	---
	10-12	10-20	9.0-13.0	5.6-7.3	---	---	---	---
	12-41	18-27	9.0-13.0	5.6-6.5	---	---	---	---
	41-80	10-18	5.0-10.0	7.4-8.4	15-25	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1343C:								
Lida----------	0-8	5-18	6.0-19.0	5.6-7.3	---	---	---	---
	8-13	3-15	1.0-10.0	5.6-7.3	---	---	---	---
	13-22	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	22-38	1-5	1.0-4.0	5.6-7.3	---	---	---	---
	38-80	1-5	1.0-4.0	7.4-8.4	3-15	---	---	---
Almora----------	0-9	12-20	12.0-20.0	5.6-7.3	---	---	---	---
	9-12	12-20	8.0-14.0	5.6-7.3	---	---	---	---
	12-25	18-30	10.0-17.0	5.6-7.3	---	---	---	---
	25-28	3-12	2.0-7.0	5.6-7.8	0-5	---	---	---
	28-80	1-4	1.0-3.0	7.4-8.4	5-30	---	---	---
Lizzie----------	0-8	8-18	9.0-20.0	6.1-7.3	---	---	---	---
	8-18	18-35	8.0-22.0	6.1-7.3	---	---	---	---
	18-42	8-20	6.0-13.0	7.4-8.4	12-35	---	---	---
	42-80	3-16	2.0-10.0	7.4-8.4	12-35	---	---	---
1344B:								
Lida----------	0-7	5-18	6.0-19.0	5.6-7.3	---	---	---	---
	7-23	8-18	4.0-13.0	5.6-7.3	---	---	---	---
	23-30	1-5	1.0-4.0	5.6-7.3	---	---	---	---
	30-80	1-5	1.0-4.0	7.4-8.4	3-15	---	---	---
Almora----------	0-10	12-20	12.0-20.0	5.6-7.3	---	---	---	---
	10-15	12-20	8.0-14.0	5.6-7.3	---	---	---	---
	15-39	18-30	10.0-17.0	5.6-7.3	---	---	---	---
	39-80	1-4	1.0-3.0	7.4-8.4	5-30	---	---	---
Dent----------	0-15	8-18	8.0-21.0	6.1-7.3	---	---	---	---
	15-38	18-35	10.0-20.0	5.1-7.3	---	---	---	---
	38-62	8-27	4.0-15.0	7.4-7.8	10-20	---	---	---
	62-80	5-20	3.0-11.0	7.4-8.4	5-15	---	---	---
1345:								
Bluffcreek------	0-8	5-14	6.0-18.0	5.6-7.3	---	---	---	---
	8-19	3-10	1.0-7.0	5.6-7.3	---	---	---	---
	19-47	8-18	3.0-12.0	5.6-7.3	---	---	---	---
	47-60	1-5	0.0-4.0	6.1-8.4	0-30	---	---	---
Rosy----------	0-9	3-12	1.0-15.0	5.1-7.3	---	---	---	---
	9-48	8-18	4.0-10.0	5.1-7.3	---	---	---	---
	48-60	6-18	3.0-10.0	5.6-8.4	0-30	---	---	---
1346:								
Nidaros---------	0-25	---	140-180	7.4-9.0	10-40	---	---	---
	25-42	8-35	14.0-68.0	6.6-8.4	5-20	---	---	---
	42-60	0-4	0.0-3.0	6.6-8.4	0-5	---	---	---
1347B:								
Kandota---------	0-8	10-20	8.0-20.0	5.6-7.3	---	---	---	---
	8-11	5-18	3.0-13.0	5.1-6.5	---	---	---	---
	11-26	18-30	7.0-19.0	5.6-7.3	---	---	---	---
	26-46	12-18	5.0-12.0	7.4-8.4	15-25	---	---	---
	46-80	7-18	3.0-10.0	7.4-8.4	5-15	---	---	---
1348:								
Knute----------	0-11	12-20	9.0-20.0	6.1-7.3	---	---	---	---
	11-16	18-28	8.0-19.0	6.1-7.8	---	---	---	---
	16-45	10-18	4.0-12.0	7.4-8.4	20-30	---	---	---
	45-65	10-18	4.0-12.0	7.4-8.4	15-25	---	---	---
	65-80	10-18	3.0-10.0	7.4-8.4	5-15	---	---	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
1349:								
Clotho----------	0-14	10-25	15.0-28.0	7.4-8.4	2-10	---	---	---
	14-28	8-18	5.0-14.0	7.4-8.4	5-20	---	---	---
	28-60	8-15	4.0-7.0	7.4-8.4	5-10	---	---	---
1350:								
Brandsvold------	0-13	10-20	7.0-15.0	6.1-7.3	---	---	---	---
	13-61	18-27	9.0-13.0	5.6-6.5	---	---	---	---
	61-80	10-18	5.0-10.0	7.4-8.4	15-25	---	---	---
1351:								
Bluffton--------	0-10	14-25	12.0-30.0	5.6-7.3	---	---	---	---
	10-53	18-30	7.0-25.0	5.6-7.3	---	---	---	---
	53-80	16-24	7.0-20.0	6.6-8.4	0-15	---	---	---
1365:								
Hillview--------	0-7	5-15	6.0-15.0	5.1-7.3	---	---	---	---
	7-15	3-12	3.0-8.0	5.1-6.5	---	---	---	---
	15-29	8-18	5.0-11.0	5.1-7.3	---	---	---	---
	29-60	3-12	2.0-7.0	5.1-8.4	0-12	---	---	---
1396:								
Sedgeville------	0-7	0-23	10.0-45.0	6.1-8.4	0-20	---	---	---
	7-24	8-17	5.0-20.0	6.1-8.4	0-20	---	---	---
	24-60	2-5	2.0-5.0	6.6-8.4	0-20	---	---	---
Nidaros---------	0-21	---	110-170	4.5-7.8	---	---	---	---
	21-27	8-35	13.0-51.0	5.6-8.4	---	---	---	---
	27-80	0-4	1.0-3.0	5.6-8.4	0-5	---	---	---
Aquolls---------	0-10	10-20	11.0-22.0	6.1-8.4	0-10	---	---	---
	10-24	12-27	7.0-16.0	6.1-8.4	0-10	---	---	---
	24-60	2-18	1.0-10.0	6.1-8.4	0-10	---	---	---
1397:								
Bemidji---------	0-8	2-10	3.0-11.0	5.6-6.5	---	---	---	---
	8-36	2-10	2.0-7.0	5.6-6.5	---	---	---	---
	36-45	12-27	6.0-15.0	6.1-7.3	---	---	---	---
	45-60	7-18	4.0-10.0	7.4-8.4	0-5	---	---	---
1825B:								
Seelyeville-----	0-60	---	140-200	6.1-7.8	0-15	---	---	---
1874:								
Radium----------	0-11	1-8	3.0-12.0	6.1-7.8	0-5	---	---	---
	11-18	1-8	2.0-8.0	6.6-8.4	2-10	---	---	---
	18-24	1-8	1.0-5.0	7.4-8.4	5-15	---	---	---
	24-60	1-5	1.0-5.0	7.4-8.4	5-15	---	---	---
1943:								
Roscommon-------	0-6	2-12	9.0-23.0	5.6-7.8	---	---	---	---
	6-60	0-10	1.0-4.0	5.6-8.4	0-10	---	---	---
1975:								
Oylen----------	0-13	7-12	8.0-14.0	6.1-7.3	---	---	---	---
	13-22	7-18	5.0-13.0	6.1-7.3	---	---	---	---
	22-26	2-6	1.0-3.0	6.1-7.3	---	---	---	---
	26-60	0-4	0.0-2.0	6.6-8.4	0-15	---	---	---

Water 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 soil name	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	High water table and ponding: Kind of water table	High water table and ponding: Months	High water table and ponding: Ponding duration	High water table and ponding: Maximum ponding depth
					Ft				Ft
7A, 7B, 7C:									
Hubbard	A	None	---	---	>6.0	---	---	---	---
26:									
Aazdahl	B	None	---	---	2.5-3.5	Apparent	Oct-Jun	---	---
34:									
Parnell	C/D	None	---	---	0.0-0.5	Apparent	Jan-Dec	Very long	1.0
38B, 38C2, 38D2, 38E:									
Waukon	B	None	---	---	>6.0	---	---	---	---
46:									
Borup	B/D	None	---	---	0.5-1.5	Apparent	Apr-Jul	---	---
53B, 53C, 53D:									
Kandota	B	None	---	---	>6.0	---	---	---	---
58:									
Kittson	C	None	---	---	2.5-3.5	Apparent	Nov-Jun	---	---
59:									
Grimstad	B	None	---	---	2.5-3.5	Apparent	Apr-Jul	---	---
61:									
Arveson	B/D	None	---	---	0.5-1.5	Apparent	Apr-Jul	---	---
63:									
Rockwell	B/D	None	---	---	0.5-1.5	Apparent	Apr-Jul	---	---
65:									
Foxhome	B	None	---	---	2.5-3.5	Apparent	Oct-Jun	---	---
66:									
Flaming	A	None	---	---	2.5-3.5	Apparent	Nov-Jun	---	---
68:									
Arveson	B/D	None	---	---	0.0-0.5	Apparent	Jan-Dec	Very long	1.0
107:									
Winger	B/D	None	---	---	0.5-1.5	Apparent	Nov-Jun	---	---
108:									
McIntosh	B	None	---	---	2.5-3.5	Apparent	Apr-Nov	---	---
121:									
Wykeham	B	None	---	---	2.5-3.5	Apparent	Apr-Jun	---	---
127A, 127B, 127C:									
Sverdrup	B	None	---	---	>6.0	---	---	---	---
141B, 141C, 141D:									
Egeland	B	None	---	---	>6.0	---	---	---	---
168B:									
Forman	B	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	High water table and ponding: Kind of water table	High water table and ponding: Months	High water table and ponding: Ponding duration	High water table and ponding: Maximum ponding depth
					Ft				Ft
180:									
Gonvick---------	B	None-------	---	---	2.5-3.5	Apparent---	Nov-Jun	---	---
184:									
Hamerly---------	C	None-------	---	---	2.0-4.0	Apparent---	Apr-Jun	---	---
187:									
Haug----------	B/D	None-------	---	---	0.0-0.5	Apparent---	Jan-Dec	Very long	1.0
191:									
Epoufette-------	B/D	None-------	---	---	0.5-2.0	Apparent---	Nov-Jun	---	---
202:									
Meehan----------	B	None-------	---	---	1.0-2.5	Apparent---	Oct-Jun	---	---
258A, 258B, 258C:									
Sandberg--------	A	None-------	---	---	>6.0	---	---	---	---
260:									
Duelm----------	A	None-------	---	---	2.5-3.5	Apparent---	Mar-Jun	---	---
267B, 267C, 267E, 267F:									
Snellman-------	B	None-------	---	---	>6.0	---	---	---	---
290:									
Rothsay---------	B	None-------	---	---	>6.0	---	---	---	---
293B:									
Swenoda---------	B	None-------	---	---	2.5-4.0	Perched----	Mar-Jun	---	---
335:									
Urness----------	B/D	None-------	---	---	0.0-0.5	Apparent---	Jan-Dec	Very long	1.0
339:									
Fordville-------	B	None-------	---	---	>6.0	---	---	---	---
341A, 341B:									
Arvilla---------	B	None-------	---	---	>6.0	---	---	---	---
371:									
Clontarf--------	B	None-------	---	---	2.5-3.5	Apparent---	Nov-Jun	---	---
375:									
Forada----------	B/D	None-------	---	---	0.5-1.5	Apparent---	Oct-Jun	---	---
402C, 402E:									
Sioux----------	A	None-------	---	---	>6.0	---	---	---	---
406A, 406B:									
Dorset----------	B	None-------	---	---	>6.0	---	---	---	---
418:									
Lamoure---------	C	Occasional	Brief-----	Mar-Oct	0.0-1.5	Apparent---	Oct-Jun	---	---
422B, 422C:									
Bygland---------	C	None-------	---	---	2.5-4.0	Apparent---	Apr-Jun	---	---
426:									
Foldahl---------	B	None-------	---	---	2.5-3.5	Apparent---	Nov-Jun	---	---

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	High water table and ponding: Kind of water table	High water table and ponding: Months	High water table and ponding: Ponding duration	High water table and ponding: Maximum ponding depth
					Ft				Ft
441A, 441B, 441C:									
Almora	B	None	---	---	>6.0	---	---	---	---
481:									
Kratka	B/D	None	---	---	0.5-1.5	Apparent	Apr-Jul	---	---
494:									
Darnen	B	None	---	---	3.5-6.0	Apparent	Nov-Jun	---	---
497:									
Hantho	B	None	---	---	2.5-3.5	Apparent	Mar-Jun	---	---
508:									
Wyndmere	C	None	---	---	1.5-3.5	Apparent	Apr-Jun	---	---
540:									
Seelyeville	A/D	None	---	---	0.0-0.5	Apparent	Oct-Jun	Very long	1.0
541:									
Rifle	A/D	None	---	---	0.0-1.0	Apparent	Nov-Jun	Very long	1.0
544:									
Cathro	A/D	None	---	---	0.0-1.0	Apparent	Oct-Jun	Very long	1.0
567A, 567B:									
Verndale	B	None	---	---	>6.0	---	---	---	---
609B:									
Dickey	B	None	---	---	>6.0	---	---	---	---
624:									
Rosy	B	None	---	---	2.5-3.5	Apparent	Apr-Jun	---	---
646C, 646D:									
Peever	C	None	---	---	>6.0	---	---	---	---
670:									
Knute	B	None	---	---	2.5-3.5	Apparent	Mar-Jun	---	---
680:									
Parnell	C/D	None	---	---	0.5-1.5	Apparent	Nov-Jun	---	---
698:									
Doran	C	None	---	---	3.0-5.0	Apparent	Apr-Jun	---	---
701:									
Runeberg	C/D	None	---	---	0.0-0.5	Apparent	Jan-Dec	Very long	1.0
705B, 705C:									
Nitche	B	None	---	---	>6.0	---	---	---	---
Kandota	B	None	---	---	>6.0	---	---	---	---
Lida	B	None	---	---	>6.0	---	---	---	---
707B, 707C2, 707D2:									
Lizzie	B	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	High water table and ponding: Kind of water table	High water table and ponding: Months	High water table and ponding: Ponding duration	High water table and ponding: Maximum ponding depth
					Ft				Ft
710:									
Friberg---------	B/D	None-------	---	---	0.5-1.5	Apparent---	Nov-Jul	---	---
Weetown---------	B	None-------	---	---	3.5-6.0	Apparent---	Oct-Jul	---	---
711B, 711C:									
Arvilla---------	B	None-------	---	---	>6.0	---	---	---	---
Sandberg--------	A	None-------	---	---	>6.0	---	---	---	---
715:									
Bluffcreek------	B	None-------	---	---	2.5-4.0	Apparent---	Oct-Jun	---	---
Clearriver------	B	None-------	---	---	2.5-3.5	Apparent---	Apr-Jun	---	---
716B, 716C, 716D:									
Leaflake--------	B	None-------	---	---	>6.0	---	---	---	---
Eagleview-------	A	None-------	---	---	>6.0	---	---	---	---
718E:									
Naytahwaush-----	B	None-------	---	---	>6.0	---	---	---	---
721B, 721C, 721D, 721E:									
Corliss--------	A	None-------	---	---	>6.0	---	---	---	---
726:									
Kratka----------	B/D	None-------	---	---	0.0-0.5	Apparent---	Apr-Jul	Very long	1.0
746:									
Haslie----------	A/D	None-------	---	---	0.0-0.5	Apparent---	Nov-Jul	Very long	1.0
760C2, 760D2:									
Chapett---------	B	None-------	---	---	>6.0	---	---	---	---
Sisseton--------	B	None-------	---	---	>6.0	---	---	---	---
769B:									
Mehurin---------	C	None-------	---	---	2.5-3.5	Apparent---	Apr-Jun	---	---
776B, 776C, 776E:									
Snellman--------	B	None-------	---	---	>6.0	---	---	---	---
Sugarbush-------	B	None-------	---	---	>6.0	---	---	---	---
777C2, 777D2, 777E:									
Sisseton-------	B	None-------	---	---	>6.0	---	---	---	---
Heimdal--------	B	None-------	---	---	>6.0	---	---	---	---
778B, 778C:									
Dorset----------	B	None-------	---	---	>6.0	---	---	---	---
Corliss---------	A	None-------	---	---	>6.0	---	---	---	---
779B:									
Peever----------	C	None-------	---	---	>6.0	---	---	---	---
Mehurin---------	C	None-------	---	---	2.5-3.5	Apparent---	Apr-Jun	---	---

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	High water table and ponding: Kind of water table	High water table and ponding: Months	High water table and ponding: Ponding duration	High water table and ponding: Maximum ponding depth
					Ft				Ft
902B:									
Barnes	B	None	---	---	>6.0	---	---	---	---
Buse	B	None	---	---	>6.0	---	---	---	---
903C2:									
Barnes	B	None	---	---	>6.0	---	---	---	---
Langhei	B	None	---	---	>6.0	---	---	---	---
915C2, 915D2:									
Forman	B	None	---	---	>6.0	---	---	---	---
Buse	B	None	---	---	>6.0	---	---	---	---
931C2, 931D2:									
Formdale	B	None	---	---	>6.0	---	---	---	---
Langhei	B	None	---	---	>6.0	---	---	---	---
942D2:									
Langhei	B	None	---	---	>6.0	---	---	---	---
Barnes	B	None	---	---	>6.0	---	---	---	---
957B2:									
Rothsay	B	None	---	---	>6.0	---	---	---	---
Zell	B	None	---	---	>6.0	---	---	---	---
969C2, 969D2:									
Zell	B	None	---	---	>6.0	---	---	---	---
Rothsay	B	None	---	---	>6.0	---	---	---	---
1015:									
Udipsamments	A	None	---	---	>6.0	---	---	---	---
1016:									
Udorthents	B	None	---	---	>6.0	---	---	---	---
1027:									
Udorthents.									
1030:									
Pits.									
Udipsamments	A	None	---	---	>6.0	---	---	---	---
1077:									
Forada	B/D	None	---	---	0.0-0.5	Apparent	Jan-Dec	Very long	1.0
Leafriver	A/D	None	---	---	0.0-0.5	Apparent	Nov-Jul	Very long	1.0
1102B, 1102C:									
Chapett	B	None	---	---	>6.0	---	---	---	---
Dorset	B	None	---	---	>6.0	---	---	---	---
1103:									
Clitherall	B	None	---	---	2.5-4.0	Apparent	Oct-Mar	---	---

Water Features--Continued

Map symbol and soil name	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	High water table and ponding: Kind of water table	High water table and ponding: Months	High water table and ponding: Ponding duration	Maximum ponding depth
					Ft				Ft
1104B, 1104C, 1104D:									
Waukon	B	None	---	---	>6.0	---	---	---	---
Dorset	B	None	---	---	>6.0	---	---	---	---
1105B:									
Dent	B	None	---	---	2.5-4.0	Apparent	Mar-Jul	---	---
1110:									
Isan	A/D	None	---	---	0.5-1.5	Apparent	Oct-Jun	---	---
1111:									
Nidaros	A/D	Frequent	Long	Mar-Nov	0.0-0.5	Apparent	Oct-Jun	Very long	1.0
1112D, 1112E:									
Chapett	B	None	---	---	>6.0	---	---	---	---
Corliss	A	None	---	---	>6.0	---	---	---	---
1113:									
Haslie	D	None	---	---	0.0-0.0	Apparent	Jan-Dec	Very long	3.0
Seelyeville	D	None	---	---	0.0-0.0	Apparent	Jan-Dec	Very long	3.0
Cathro	D	None	---	---	0.0-0.5	Apparent	Jan-Dec	Very long	4.0
1114:									
Hangaard	A/D	None	---	---	0.5-1.5	Apparent	Apr-Jul	---	---
1120:									
Rushlake	A	None	---	---	2.5-3.5	Apparent	Jan-Dec	---	---
Hangaard	A/D	None	---	---	0.5-1.5	Apparent	Apr-Jul	---	---
1129:									
Lindaas	C/D	None	---	---	0.5-1.5	Apparent	Oct-Jul	---	---
1131B:									
Verndale	B	None	---	---	>6.0	---	---	---	---
Abbeylake	A	None	---	---	>6.0	---	---	---	---
1136:									
Nidaros	A/D	None	---	---	0.0-0.5	Apparent	Oct-Jun	Very long	1.0
1149:									
Hamerly	C	None	---	---	1.5-3.5	Apparent	Apr-Jun	---	---
1195A, 1195B, 1195C, 1195E:									
Sybil	B	None	---	---	>6.0	---	---	---	---
Eagleview	A	None	---	---	>6.0	---	---	---	---
1196B, 1196C, 1196E, 1196F:									
Lida	B	None	---	---	>6.0	---	---	---	---
Two Inlets	A	None	---	---	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	High water table and ponding: Kind of water table	High water table and ponding: Months	High water table and ponding: Ponding duration	High water table and ponding: Maximum ponding depth
					Ft				Ft
1200:									
Egglake	B	None	---	---	0.5-1.5	Apparent	Oct-Jul	---	---
1208B:									
Naytahwaush	B	None	---	---	>6.0	---	---	---	---
Mahkonce	C	None	---	---	2.5-3.5	Apparent	Mar-May	---	---
1209C:									
Naytahwaush	B	None	---	---	>6.0	---	---	---	---
1212B:									
Mahkonce	C	None	---	---	2.5-3.5	Apparent	Mar-May	---	---
1214:									
Mustinka	C/D	None	---	---	0.0-1.0	Apparent	Nov-Jun	---	---
1215:									
Pinelake	B/D	None	---	---	0.5-1.5	Apparent	Nov-Jun	---	---
1216B:									
Egglake	B	None	---	---	0.5-1.5	Apparent	Oct-Jul	---	---
Wykeham	B	None	---	---	2.5-3.5	Apparent	Apr-Jun	---	---
1217E:									
Waukon	B	None	---	---	>6.0	---	---	---	---
Lida	B	None	---	---	>6.0	---	---	---	---
1218B, 1218C, 1218E, 1218F:									
Snellman	B	None	---	---	>6.0	---	---	---	---
Lida	B	None	---	---	>6.0	---	---	---	---
1219C:									
Sandberg	A	None	---	---	>6.0	---	---	---	---
Sverdrup	B	None	---	---	>6.0	---	---	---	---
1221B:									
Sverdrup	B	None	---	---	>6.0	---	---	---	---
Sandberg	A	None	---	---	>6.0	---	---	---	---
1223D:									
Sandberg	A	None	---	---	>6.0	---	---	---	---
Arvilla	B	None	---	---	>6.0	---	---	---	---
1227:									
Quam	B/D	None	---	---	0.0-0.5	Apparent	Jan-Dec	Very long	1.0
Cathro	D	None	---	---	0.0-0.5	Apparent	Jan-Dec	Very long	4.0
Urness	B/D	None	---	---	0.0-0.0	Apparent	Jan-Dec	Very long	3.0
1230:									
Haslie	D	None	---	---	0.0-0.0	Apparent	Jan-Dec	Very long	3.0
Nidaros	D	None	---	---	0.0-0.0	Apparent	Jan-Dec	Very long	3.0

Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	High water table and ponding: Kind of water table	High water table and ponding: Months	High water table and ponding: Ponding duration	High water table and ponding: Maximum ponding depth
					Ft				Ft
1232B, 1232E:									
Chapett	B	None	---	---	>6.0	---	---	---	---
1234B:									
Formdale	B	None	---	---	>6.0	---	---	---	---
Buse	B	None	---	---	>6.0	---	---	---	---
1237:									
Lakepark	B/D	None	---	---	0.5-1.5	Apparent	Nov-Jun	---	---
1239:									
Quam	B/D	None	---	---	0.0-0.5	Apparent	Jan-Dec	Very long	1.0
1240:									
Roliss	B/D	None	---	---	0.5-1.5	Apparent	Apr-Jul	---	---
1247D:									
Corliss	A	None	---	---	>6.0	---	---	---	---
Dorset	B	None	---	---	>6.0	---	---	---	---
1250C:									
Abbeylake	A	None	---	---	>6.0	---	---	---	---
Verndale	B	None	---	---	>6.0	---	---	---	---
1259:									
Hamerly	C	None	---	---	1.5-3.5	Apparent	Apr-Jun	---	---
Mustinka	C/D	None	---	---	0.0-1.0	Apparent	Nov-Jun	---	---
1275B, 1275C:									
Kandota	B	None	---	---	>6.0	---	---	---	---
Egglake	C/D	None	---	---	0.0-0.5	Apparent	Mar-Dec	Very long	1.0
1276:									
Knute	B	None	---	---	2.5-3.5	Apparent	Mar-Jun	---	---
Brandsvold	C/D	None	---	---	0.5-1.5	Apparent	Mar-Jun	---	---
1277D:									
Corliss	A	None	---	---	>6.0	---	---	---	---
Sverdrup	B	None	---	---	>6.0	---	---	---	---
1289:									
Knute	B	None	---	---	2.5-3.5	Apparent	Mar-Jun	---	---
1290:									
Brandsvold	C/D	None	---	---	0.5-1.5	Apparent	Mar-Jun	---	---
1291:									
Sedgeville	D	Frequent	Long	Mar-Jun	0.0-0.5	Apparent	Jan-Dec	Very long	1.0
1293:									
Sedgeville	D	Rare	---	---	0.5-1.5	Apparent	Nov-Jun	---	---
1304A:									
Glyndon	B	None	---	---	1.5-2.5	Apparent	Apr-Jun	---	---

Water Features--Continued

Map symbol and soil name	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	High water table and ponding: Kind of water table	High water table and ponding: Months	High water table and ponding: Ponding duration	High water table and ponding: Maximum ponding depth
					Ft				Ft
1307:									
Rushlake	A	None	---	---	2.5-3.5	Apparent	Jan-Dec	---	---
1317:									
Vallers	C	None	---	---	0.5-1.5	Apparent	Apr-Jun	---	---
1319B, 1319C, 1319D:									
Rockwood	C	None	---	---	>6.0	---	---	---	---
1320B:									
Blowers	B	None	---	---	2.0-3.5	Perched	Oct-Jun	---	---
1321:									
Paddock	C/D	None	---	---	1.0-2.0	Perched	Nov-Jun	---	---
Becida	C/D	None	---	---	0.0-1.0	Perched	Oct-Jul	---	---
1322:									
Wolverton	B	None	---	---	2.5-3.5	Apparent	Mar-Jun	---	---
1324B:									
Heimdal	B	None	---	---	>6.0	---	---	---	---
Sisseton	B	None	---	---	>6.0	---	---	---	---
1338:									
Oakcreek	B	None	---	---	2.5-4.0	Apparent	Nov-Jun	---	---
1339:									
Borup	B/D	None	---	---	0.0-0.5	Apparent	Jan-Dec	Very long	1.0
1340:									
Bluffcreek	B	None	---	---	2.5-4.0	Apparent	Oct-Jun	---	---
Epoufette	B/D	None	---	---	0.5-2.0	Apparent	Nov-Jun	---	---
1341:									
Clitherall	B	None	---	---	2.5-4.0	Apparent	Oct-Mar	---	---
Wykeham	B	None	---	---	2.5-3.5	Apparent	Apr-Jun	---	---
1342:									
Pinelake	B/D	None	---	---	0.5-1.5	Apparent	Nov-Jun	---	---
Brandsvold	C/D	None	---	---	0.5-1.5	Apparent	Mar-Jun	---	---
1343C:									
Lida	B	None	---	---	>6.0	---	---	---	---
Almora	B	None	---	---	>6.0	---	---	---	---
Lizzie	B	None	---	---	>6.0	---	---	---	---
1344B:									
Lida	B	None	---	---	>6.0	---	---	---	---
Almora	B	None	---	---	>6.0	---	---	---	---
Dent	B	None	---	---	2.5-4.0	Apparent	Mar-Jul	---	---

Water Features--Continued

Map symbol and soil name	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	High water table and ponding: Kind of water table	High water table and ponding: Months	High water table and ponding: Ponding duration	Maximum ponding depth
					Ft				Ft
1345:									
Bluffcreek	B	None	---	---	2.5-4.0	Apparent	Oct-Jun	---	---
Rosy	B	None	---	---	2.5-3.5	Apparent	Apr-Jun	---	---
1346:									
Nidaros	A/D	None	---	---	0.0-1.0	Apparent	Oct-Jul	Very long	1.0
1347B:									
Kandota	B	None	---	---	>6.0	---	---	---	---
1348:									
Knute	B	None	---	---	2.5-3.5	Apparent	Mar-Jun	---	---
1349:									
Clotho	C/D	None	---	---	0.5-1.5	Apparent	Apr-Jul	---	---
1350:									
Brandsvold	C/D	None	---	---	0.5-1.5	Apparent	Mar-Jun	---	---
1351:									
Bluffton	C/D	None	---	---	0.0-0.5	Apparent	Jan-Dec	Very long	1.0
1365:									
Hillview	B/D	None	---	---	0.5-1.5	Apparent	Nov-Jul	---	---
1396:									
Sedgeville	D	Frequent	Long	Mar-Jun	0.0-0.5	Apparent	Jan-Dec	Very long	1.0
Nidaros	A/D	None	---	---	0.0-0.5	Apparent	Oct-Jun	Very long	1.0
Aquolls	D	None	---	---	0.0-1.5	Apparent	Jan-Dec	Very long	0.5
1397:									
Bemidji	B	None	---	---	2.5-4.0	Apparent	Mar-Jul	---	---
1825B:									
Seelyeville	D	None	---	---	0.0-2.0	Apparent	Jan-Dec	---	---
1874:									
Radium	A	None	---	---	2.5-3.5	Apparent	Apr-Oct	---	---
1943:									
Roscommon	A/D	None	---	---	0.0-1.0	Apparent	Sep-Jun	---	---
1975:									
Oylen	C	None	---	---	2.5-3.5	Apparent	Oct-Jun	---	---

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 soil name	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
7A, 7B, 7C:							
Hubbard	>60	---	---	---	Low	Low	Low.
26:							
Aazdahl	>60	---	---	---	High	Moderate	Low.
34:							
Parnell	>60	---	---	---	High	High	Low.
38B, 38C2, 38D2, 38E:							
Waukon	>60	---	---	---	Moderate	Low	Low.
46:							
Borup	>60	---	---	---	High	High	Low.
53B, 53C, 53D:							
Kandota	>60	---	---	---	Moderate	Low	Moderate.
58:							
Kittson	>60	---	---	---	High	High	Low.
59:							
Grimstad	>60	---	---	---	Moderate	Moderate	Low.
61:							
Arveson	>60	---	---	---	High	High	Low.
63:							
Rockwell	>60	---	---	---	High	High	Low.
65:							
Foxhome	>60	---	---	---	High	Moderate	Low.
66:							
Flaming	>60	---	---	---	Moderate	Low	Low.
68:							
Arveson	>60	---	---	---	High	High	Low.
107:							
Winger	>60	---	---	---	High	High	Low.
108:							
McIntosh	>60	---	---	---	High	High	Low.
121:							
Wykeham	>60	---	---	---	Moderate	Moderate	Moderate.
127A, 127B, 127C:							
Sverdrup	>60	---	---	---	Low	Low	Low.
141B, 141C, 141D:							
Egeland	>60	---	---	---	Low	Moderate	Low.
168B:							
Forman	>60	---	---	---	Moderate	High	Low.

Soil Features--Continued

Map symbol and soil name	Bedrock Depth	Bedrock Hardness	Subsidence Initial	Subsidence Total	Potential frost action	Risk of corrosion Uncoated steel	Risk of corrosion Concrete
	In		In	In			
180:							
Gonvick	>60	---	---	---	High	Moderate	Low.
184:							
Hamerly	>60	---	---	---	High	High	Low.
187:							
Haug	>60	---	---	---	High	High	Low.
191:							
Epoufette	>60	---	---	---	High	High	Moderate.
202:							
Meehan	>60	---	---	---	Moderate	Low	Moderate.
258A, 258B, 258C:							
Sandberg	>60	---	---	---	Low	Moderate	Low.
260:							
Duelm	>60	---	---	---	Moderate	Low	Moderate.
267B, 267C, 267E, 267F:							
Snellman	>60	---	---	---	Moderate	Low	Moderate.
290:							
Rothsay	>60	---	---	---	High	Low	Low.
293B:							
Swenoda	>60	---	---	---	Moderate	High	Moderate.
335:							
Urness	>60	---	---	---	High	High	Low.
339:							
Fordville	>60	---	---	---	Low	Moderate	Low.
341A, 341B:							
Arvilla	>60	---	---	---	Low	Moderate	Low.
371:							
Clontarf	>60	---	---	---	Moderate	Low	Low.
375:							
Forada	>60	---	---	---	High	High	Low.
402C, 402E:							
Sioux	>60	---	---	---	Low	Low	Low.
406A, 406B:							
Dorset	>60	---	---	---	Low	Low	Moderate.
418:							
Lamoure	>60	---	---	---	High	High	Moderate.
422B, 422C:							
Bygland	>60	---	---	---	High	High	Low.
426:							
Foldahl	>60	---	---	---	High	Moderate	Low.
441A, 441B, 441C:							
Almora	>60	---	---	---	Moderate	Low	Moderate.

Soil Features--Continued

Map symbol and soil name	Bedrock Depth	Bedrock Hardness	Subsidence Initial	Subsidence Total	Potential frost action	Risk of corrosion Uncoated steel	Risk of corrosion Concrete
	In		In	In			
481:							
Kratka	>60	---	---	---	Moderate	High	Low.
494:							
Darnen	>60	---	---	---	Moderate	High	Low.
497:							
Hantho	>60	---	---	---	High	Moderate	Low.
508:							
Wyndmere	>60	---	---	---	High	Moderate	Low.
540:							
Seelyeville	>60	---	---	50-55	High	High	Moderate.
541:							
Rifle	>60	---	---	---	High	High	Low.
544:							
Cathro	>60	---	---	19-22	High	High	Low.
567A, 567B:							
Verndale	>60	---	---	---	Low	Low	Low.
609B:							
Dickey	>60	---	---	---	Low	High	Low.
624:							
Rosy	>60	---	---	---	Moderate	Moderate	Moderate.
646C, 646D:							
Peever	>60	---	---	---	Moderate	High	Moderate.
670:							
Knute	>60	---	---	---	Moderate	Moderate	Low.
680:							
Parnell	>60	---	---	---	High	High	Low.
698:							
Doran	>60	---	---	---	High	High	Low.
701:							
Runeberg	>60	---	---	---	High	High	Low.
705B, 705C:							
Nitche	>60	---	---	---	Low	Low	Moderate.
Kandota	>60	---	---	---	Moderate	Low	Moderate.
Lida	>60	---	---	---	Low	Low	Low.
707B, 707C2, 707D2:							
Lizzie	>60	---	---	---	High	Low	Low.
710:							
Friberg	>60	---	---	---	High	High	Low.
Weetown	>60	---	---	---	Moderate	Moderate	Low.

Soil Features--Continued

Map symbol and soil name	Bedrock Depth	Bedrock Hardness	Subsidence Initial	Subsidence Total	Potential frost action	Risk of corrosion Uncoated steel	Risk of corrosion Concrete
	In		In	In			
711B, 711C:							
Arvilla	>60	---	---	---	Low	Moderate	Low.
Sandberg	>60	---	---	---	Low	Moderate	Low.
715:							
Bluffcreek	>60	---	---	---	Moderate	Low	Low.
Clearriver	>60	---	---	---	Low	Low	Moderate.
716B, 716C, 716D:							
Leaflake	>60	---	---	---	Low	Low	Low.
Eagleview	>60	---	---	---	Low	Low	Low.
718E:							
Naytahwaush	>60	---	---	---	Moderate	Moderate	Low.
721B, 721C, 721D, 721E:							
Corliss	>60	---	---	---	Low	Low	Low.
726:							
Kratka	>60	---	---	---	Moderate	High	Low.
746:							
Haslie	>60	---	---	---	High	High	Moderate.
760C2, 760D2:							
Chapett	>60	---	---	---	Moderate	Low	Low.
Sisseton	>60	---	---	---	Moderate	High	Low.
769B:							
Mehurin	>60	---	---	---	Moderate	High	Low.
776B, 776C, 776E:							
Snellman	>60	---	---	---	Moderate	Low	Moderate.
Sugarbush	>60	---	---	---	Low	Low	Low.
777C2, 777D2, 777E:							
Sisseton	>60	---	---	---	Moderate	High	Low.
Heimdal	>60	---	---	---	Moderate	High	Low.
778B, 778C:							
Dorset	>60	---	---	---	Low	Low	Moderate.
Corliss	>60	---	---	---	Low	Low	Low.
779B:							
Peever	>60	---	---	---	Moderate	High	Moderate.
Mehurin	>60	---	---	---	Moderate	High	Low.
902B:							
Barnes	>60	---	---	---	Moderate	Moderate	Low.
Buse	>60	---	---	---	Moderate	Low	Low.

Soil Features--Continued

Map symbol and soil name	Bedrock Depth	Bedrock Hardness	Subsidence Initial	Subsidence Total	Potential frost action	Risk of corrosion Uncoated steel	Risk of corrosion Concrete
	In		In	In			
903C2:							
Barnes	>60	---	---	---	Moderate	Moderate	Low.
Langhei	>60	---	---	---	Moderate	Low	Low.
915C2, 915D2:							
Forman	>60	---	---	---	Moderate	High	Low.
Buse	>60	---	---	---	Moderate	Low	Low.
931C2, 931D2:							
Formdale	>60	---	---	---	Moderate	Moderate	Low.
Langhei	>60	---	---	---	Moderate	Moderate	Low.
942D2:							
Langhei	>60	---	---	---	Moderate	Low	Low.
Barnes	>60	---	---	---	Moderate	Moderate	Low.
957B2:							
Rothsay	>60	---	---	---	High	Low	Low.
Zell	>60	---	---	---	High	High	Moderate.
969C2, 969D2:							
Zell	>60	---	---	---	High	High	Moderate.
Rothsay	>60	---	---	---	High	Low	Low.
1015:							
Udipsamments	>60	---	---	---	Low	Low	Low.
1016:							
Udorthents	>60	---	---	---	Moderate	High	Moderate.
1027:							
Udorthents.							
1030:							
Pits.							
Udipsamments	>60	---	---	---	Low	Low	Low.
1077:							
Forada	>60	---	---	---	High	Low	Low.
Leafriver	>60	---	---	5-10	High	High	High.
1102B, 1102C:							
Chapett	>60	---	---	---	Moderate	Low	Low.
Dorset	>60	---	---	---	Low	Low	Moderate.
1103:							
Clitherall	>60	---	---	---	Moderate	Moderate	Moderate.
1104B, 1104C, 1104D:							
Waukon	>60	---	---	---	Moderate	Low	Low.
Dorset	>60	---	---	---	Low	Low	Moderate.

Soil Features--Continued

Map symbol and soil name	Bedrock Depth	Bedrock Hardness	Subsidence Initial	Subsidence Total	Potential frost action	Risk of corrosion Uncoated steel	Risk of corrosion Concrete
	In		In	In			
1105B:							
Dent	>60	---	---	---	High	Moderate	Low.
1110:							
Isan	>60	---	---	---	Moderate	High	Moderate.
1111:							
Nidaros	>60	---	---	25-30	High	High	Low.
1112D, 1112E:							
Chapett	>60	---	---	---	Moderate	Low	Low.
Corliss	>60	---	---	---	Low	Low	Low.
1113:							
Haslie	>60	---	---	30-45	High	High	Moderate.
Seelyeville	>60	---	---	---	High	High	Moderate.
Cathro	>60	---	---	---	High	High	Low.
1114:							
Hangaard	>60	---	---	---	Moderate	High	Low.
1120:							
Rushlake	>60	---	---	---	Moderate	Moderate	Low.
Hangaard	>60	---	---	---	Moderate	High	Low.
1129:							
Lindaas	>60	---	---	---	High	High	Low.
1131B:							
Verndale	>60	---	---	---	Low	Low	Low.
Abbeylake	>60	---	---	---	Low	Low	Low.
1136:							
Nidaros	>60	---	---	25-30	High	High	Low.
1149:							
Hamerly	>60	---	---	---	High	High	Low.
1195A, 1195B, 1195C, 1195E:							
Sybil	>60	---	---	---	Low	Low	Low.
Eagleview	>60	---	---	---	Low	Low	Low.
1196B, 1196C, 1196E, 1196F:							
Lida	>60	---	---	---	Low	Low	Low.
Two Inlets	>60	---	---	---	Low	Low	Low.
1200:							
Egglake	>60	---	---	---	High	High	Low.
1208B:							
Naytahwaush	>60	---	---	---	Moderate	Moderate	Low.
Mahkonce	>60	---	---	---	High	High	Low.

Soil Features--Continued

Map symbol and soil name	Bedrock Depth	Bedrock Hardness	Subsidence Initial	Subsidence Total	Potential frost action	Risk of corrosion Uncoated steel	Risk of corrosion Concrete
	In		In	In			
1209C:							
Naytahwaush	>60	---	---	---	Moderate	Moderate	Low.
1212B:							
Mahkonce	>60	---	---	---	High	High	Low.
1214:							
Mustinka	>60	---	---	---	High	High	Low.
1215:							
Pinelake	>60	---	---	---	High	High	Low.
1216B:							
Egglake	>60	---	---	---	High	High	Low.
Wykeham	>60	---	---	---	Moderate	Moderate	Moderate.
1217E:							
Waukon	>60	---	---	---	Moderate	Low	Low.
Lida	>60	---	---	---	Low	Low	Low.
1218B, 1218C, 1218E, 1218F:							
Snellman	>60	---	---	---	Moderate	Low	Moderate.
Lida	>60	---	---	---	Low	Low	Low.
1219C:							
Sandberg	>60	---	---	---	Low	Moderate	Low.
Sverdrup	>60	---	---	---	Low	Low	Low.
1221B:							
Sverdrup	>60	---	---	---	Low	Low	Low.
Sandberg	>60	---	---	---	Low	Moderate	Low.
1223D:							
Sandberg	>60	---	---	---	Low	Moderate	Low.
Arvilla	>60	---	---	---	Low	Moderate	Low.
1227:							
Quam	>60	---	---	---	High	High	Low.
Cathro	>60	---	---	---	High	High	Low.
Urness	>60	---	---	---	High	High	Low.
1230:							
Haslie	>60	---	---	30-45	High	High	Moderate.
Nidaros	>60	---	---	25-30	High	High	Low.
1232B, 1232E:							
Chapett	>60	---	---	---	Moderate	Low	Low.
1234B:							
Formdale	>60	---	---	---	Moderate	Moderate	Low.
Buse	>60	---	---	---	Moderate	Low	Low.

Soil Features--Continued

Map symbol and soil name	Bedrock: Depth	Bedrock: Hardness	Subsidence: Initial	Subsidence: Total	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In		In	In			
1237:							
Lakepark	>60	---	---	---	High	High	Low.
1239:							
Quam	>60	---	---	---	High	High	Low.
1240:							
Roliss	>60	---	---	---	High	High	Low.
1247D:							
Corliss	>60	---	---	---	Low	Low	Low.
Dorset	>60	---	---	---	Low	Low	Moderate.
1250C:							
Abbeylake	>60	---	---	---	Low	Low	Low.
Verndale	>60	---	---	---	Low	Low	Low.
1259:							
Hamerly	>60	---	---	---	High	High	Low.
Mustinka	>60	---	---	---	High	High	Low.
1275B, 1275C:							
Kandota	>60	---	---	---	Moderate	Low	Moderate.
Egglake	>60	---	---	---	High	High	Low.
1276:							
Knute	>60	---	---	---	Moderate	Moderate	Low.
Brandsvold	>60	---	---	---	High	High	Low.
1277D:							
Corliss	>60	---	---	---	Low	Low	Low.
Sverdrup	>60	---	---	---	Low	Low	Low.
1289:							
Knute	>60	---	---	---	Moderate	Moderate	Low.
1290:							
Brandsvold	>60	---	---	---	High	High	Low.
1291:							
Sedgeville	>60	---	---	---	High	High	Moderate.
1293:							
Sedgeville	>60	---	---	---	High	High	Moderate.
1304A:							
Glyndon	>60	---	---	---	High	High	Low.
1307:							
Rushlake	>60	---	---	---	Moderate	Moderate	Low.
1317:							
Vallers	>80	---	---	---	High	High	Low.
1319B, 1319C, 1319D:							
Rockwood	>60	---	---	---	Moderate	Low	Moderate.

Soil Features--Continued

Map symbol and soil name	Bedrock Depth	Bedrock Hardness	Subsidence Initial	Subsidence Total	Potential frost action	Risk of corrosion Uncoated steel	Risk of corrosion Concrete
	In		In	In			
1320B:							
Blowers	>60	---	---	---	High	Moderate	Moderate.
1321:							
Paddock	>60	---	---	---	High	High	Moderate.
Becida	>60	---	---	---	High	High	Moderate.
1322:							
Wolverton	>60	---	---	---	Moderate	Moderate	Low.
1324B:							
Heimdal	>60	---	---	---	Moderate	High	Low.
Sisseton	>60	---	---	---	Moderate	High	Low.
1338:							
Oakcreek	>60	---	---	---	Moderate	Moderate	Moderate.
1339:							
Borup	>60	---	---	---	High	High	Low.
1340:							
Bluffcreek	>60	---	---	---	Moderate	Low	Low.
Epoufette	>60	---	---	---	High	High	Moderate.
1341:							
Clitherall	>60	---	---	---	Moderate	Moderate	Moderate.
Wykeham	>60	---	---	---	Moderate	Moderate	Moderate.
1342:							
Pinelake	>60	---	---	---	High	High	Low.
Brandsvold	>60	---	---	---	High	High	Low.
1343C:							
Lida	>60	---	---	---	Low	Low	Low.
Almora	>60	---	---	---	Moderate	Low	Moderate.
Lizzie	>60	---	---	---	High	Low	Low.
1344B:							
Lida	>60	---	---	---	Low	Low	Low.
Almora	>60	---	---	---	Moderate	Low	Moderate.
Dent	>60	---	---	---	High	Moderate	Low.
1345:							
Bluffcreek	>60	---	---	---	Moderate	Low	Low.
Rosy	>60	---	---	---	Moderate	Moderate	Moderate.
1346:							
Nidaros	>60	---	---	25-30	High	High	Low.
1347B:							
Kandota	>60	---	---	---	Moderate	Low	Moderate.

Soil Features--Continued

Map symbol and soil name	Bedrock Depth	Bedrock Hardness	Subsidence Initial	Subsidence Total	Potential frost action	Risk of corrosion Uncoated steel	Risk of corrosion Concrete
	In		In	In			
1348:							
Knute	>60	---	---	---	Moderate	Moderate	Low.
1349:							
Clotho	>60	---	---	---	High	High	Low.
1350:							
Brandsvold	>60	---	---	---	High	High	Low.
1351:							
Bluffton	>60	---	---	---	High	High	Moderate.
1365:							
Hillview	>60	---	---	---	High	High	Moderate.
1396:							
Sedgeville	>60	---	---	---	High	High	Moderate.
Nidaros	>60	---	---	25-30	High	High	Low.
Aquolls	>60	---	---	---	High	High	Low.
1397:							
Bemidji	>60	---	---	---	Moderate	Moderate	Moderate.
1825B:							
Seelyeville	>60	---	4-12	50-55	High	High	Moderate.
1874:							
Radium	>60	---	---	---	Low	Moderate	Low.
1943:							
Roscommon	>60	---	---	---	Moderate	High	Low.
1975:							
Oylen	>60	---	---	---	Moderate	Moderate	Low.

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

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.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

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. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Beach deposits. Material, such as sand and gravel, that is generally laid down parallel to an active or relict shoreline of a postglacial 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 terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

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.

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.

Clay spot (spot symbol). This symbol is used on the detailed soil maps to show areas of map unit 1077 in which the texture of the surface layer is clay or silty clay.

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.

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.

Cropping system. Growing crops according to a planned system of rotation and management practices.

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.

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.

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.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

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.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Disturbed/made land (spot symbol). This symbol is used on the detailed soil maps to show areas where the natural soil has been significantly altered as a result of cutting, filling, grading, or shaping by machinery. The natural soil profile has been largely destroyed. These areas are 1/4 acre to 3 acres in size.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of 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 glacial 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 (spot symbol). This symbol is used on the detailed soil maps to show areas that are too steep for cultivation. These areas are 1/4 acre to 4 acres in size. They are characterized by steep drops to stream channels or steep, high bank areas around glacial lakes.

Esker. A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

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.

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. 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.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

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.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

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 relationship to underlying structures and of the history of geologic changes as recorded by these surface features. The term is particularly 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.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

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.

Gravelly spot (spot symbol). This symbol is used on the detailed soil maps to show areas, within a nongravelly map unit, in which the content of rock fragments is 15 percent or more, by volume. These areas are 1/4 acre to 3 acres in size. The symbol is not used in areas of soils that formed in glacial outwash.

Gravel pit (spot symbol). This symbol is used on the detailed soil maps to show areas of open excavations where gravelly deposits are being mined or have been mined. These areas are 1/4 acre to 3 acres in size.

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.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

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-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.

High rise (spot symbol). This symbol is used on the detailed soil maps to show areas of better drained mineral soils within areas of organic soils or within areas of open water. The areas of better drained mineral soils are 1/4 acre to 3 acres in size.

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.

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.

Lakebed. 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.

Lakeshore. A narrow strip of land in contact with or bordering a lake; especially the beach of a lake.

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.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-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.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Marsh (spot symbol). This symbol is used on the detailed soil maps to show areas of very poorly drained soils that support marsh vegetation. Most of these areas are not cropped. They support cattails and have some open water. The areas are $^1/_4$ acre to 3 acres in size.

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.

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.

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. 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.

Parent material. The unconsolidated organic and mineral material in which soil forms.

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.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

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:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 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

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

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. Common in Wisconsin and Minnesota.

Pitting (in tables). Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

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.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

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.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

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.

Sandy spot (spot symbol). This symbol is used on the detailed soil maps to show areas in which loamy sand or sand is exposed at the surface. These areas are 1/4 acre to 3 acres in size. The symbol is not used in areas of soils that formed in glacial outwash.

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.

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.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

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.

Short, steep slope (spot symbol). This symbol is used on the detailed soil maps to show elongated soil areas that have slopes at least two slope classes steeper than those of the surrounding map units. These areas are 1/4 acre to 3 acres in size.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. 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. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

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 over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spring (spot symbol). This symbol is used on the detailed soil maps to show seepy or springlike areas on side slopes. These areas most commonly support hydrophytic vegetation and are not cultivated. They are less than 3 acres in size.

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 include knob-and-kettle topography, locally including ice-walled lake plains.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. 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. 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.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

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 (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

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 glacial 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. 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.

Wet spot (spot symbol). This symbol is used on the detailed soil maps to show areas of very poorly drained soils that do not support cattails and that can be cropped in some years. These areas are $^{1}/_{4}$ acre to 3 acres in size.

Windthrow. The uprooting and tipping over of trees by the wind.