SOIL SURVEY OF

Tripp County, South Dakota

United States Department of Agriculture
Soil Conservation Service and
United States Department of the Interior
Bureau of Indian Affairs
In cooperation with
South Dakota Agricultural Experiment Station

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all who need the information, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1964–74. Soil names and descriptions were approved in 1974. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1974. This survey was made cooperatively by the Soil Conservation Service, the United States Department of the Interior, Bureau of Indian Affairs, and the South Dakota Agricultural Experiment Station. It is part of the technical assistance furnished to the Hamill and Clearfield-Keyapaha Conservation Districts and the Rosebud Sioux Tribe.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms, ranches, woodland, and wildlife areas; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All of the soils of Tripp County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all of the soils of the county in alphabetic order by map symbol and gives the capability classification of each. Also, it shows the page where each soil is described and the page for the capability unit and pasture suitability group in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the descriptions of the capability units, the range sites, and the pasture suitability groups.

Foresters and others can refer to the section, "Native woods and windbreaks" where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section, "Wildlife."

Ranchers and others can find, under "Range," information about present livestock operations and a table that describes potential production of major range plants.

Engineers and builders can find, under "Engineering," tables that contain information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section, "Formation and classification of the soils."

Newcomers in Tripp County may be especially interested in the section, "General Soil Map," where broad patterns of soils are described. They also may be interested in the information about the county in the section, "General nature of the county."

Cover: Contour stripcropping on Millboro silty clay, 3 to 6 percent slopes.

Contents

Issued July 1979

Summary of Tables

SOIL SURVEY OF TRIPP COUNTY, SOUTH DAKOTA

By Robert F. Springer, Soil Conservation Service

Soils surveyed by Robert F. Springer, William McCarty, Kendall Olson, Nilo Reber, and Davie Richmond, Soil Conservation Service[1]

United States Department of Agriculture, Soil Conservation Service, in cooperation with the United States Department of the Interior, Bureau of Indian Affairs, and the South Dakota Agricultural Experiment Station

TRIPP COUNTY is in the south-central part of South Dakota (fig. 1). It covers an area of 1,036,800 acres, of which about 320 acres is areas of water larger than 40 acres. Winner, which had a population of 3,751 in 1970 (*7*),[2] is the county seat. Other towns in the county are Colome and Witten.

About 74,500 acres of the county is Indian land and is administered by the Bureau of Indian Affairs. This land is intermingled with private land throughout the county.

Tripp County is part of two broad geologic provinces. The northern part of the county is the Pierre Shale uplands, and the southern part is Tertiary tablelands. Drainageways in the northern part of the county flow northward into the White River. The Keya Paha River flows southeastward and drains the southern part of the county. Most drainageways are well defined; however, those in the Doger-Elsmere association are poorly defined.

The climate is subhumid. Summers are hot, and winters are cold. Native grasses made up most of the original vegetation, but some trees were on bottom lands and on the south-facing slopes of Turtle Butte.

Cattle ranching and raising cash crops are the main enterprises. About 56 percent of the county is used for crops. Alfalfa, corn, oats, sorghum, and winter wheat are the main crops.

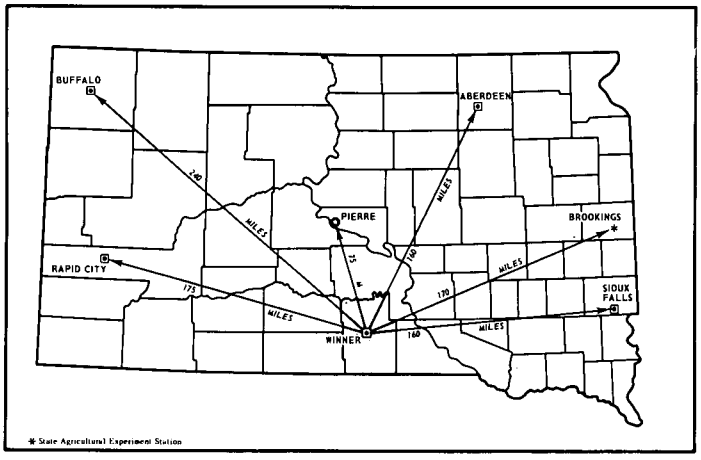

Figure 1.—**Location of Tripp County in South Dakota.**

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in Tripp County, where they are located, and how they can be used. They went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes; the size and nature of streams; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The scientists compared the profiles they studied with those in nearby counties and in more distant places. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Carter and Witten, for examples, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. An example is Ree loam, 0 to 3 percent slopes, which is one of several phases within the Ree series.

After a guide for classifying and naming the soils had been worked out, the scientists drew the bound-

[1] Others who contributed to the fieldwork are GARY HEITMAN and RUFUS WILLIAMS, United States Department of the Interior, Bureau of Indian Affairs.

[2] Italic numbers in parentheses refer to References, p. 195.

aries of the individual soils on aerial photographs. The photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, however, because it is not practical to show on such a map all the small, scattered bits of soil of some kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Three such kinds of mapping unit are shown on the soil map of Tripp County: soil complexes, soil associations, and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be mapped separately. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. An example is Doger-Elsmere complex, 0 to 3 percent slopes.

A soil association is made up of adjacent soils that occur as areas large enough to be mapped individually but are shown as one unit because the time and effort of mapping them separately cannot be justified. There is a considerable degree of uniformity in pattern and relative extent of the dominant soils, but the soils may differ greatly from one another. The name of an association consists of the names of the dominant soils, joined by a hyphen. An example is Okaton-Lakoma association, 15 to 40 percent slopes.

An undifferentiated group is made up of two or more soils that could be mapped individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. If the soils in the group are dominantly within one series but consist of undifferentiated surface textures, the word "soils" follows the series name. An undifferentiated group in this survey area is Dix soils, 9 to 18 percent slopes.

In most areas there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called miscellaneous areas and given descriptive names. Marsh is a miscellaneous area in this survey. Areas that are too small to be delineated are identified by special symbols on the soil map.

While a soil survey is in progress, scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kind of soil. Yields under defined management are estimated for all soils.

The scientists observe how soils react when used as a growing place for native and cultivated plants and as material, foundation, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or its high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties and available research data to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that finally evolve reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General soil map

The general soil map at the back of this survey shows, in color, the soil associations in the survey area. A soil association is a landscape that has a distinctive pattern of soils in defined proportions. It typically consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in an association can occur in other associations, but in different patterns.

A map showing soil associations is useful to people who want to have a general idea of the soils in a survey area, who want to compare different parts of that area, or who want to locate large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide for broad planning on a watershed, a wooded tract, or a wildlife area or for broad planning of recreational facilities, community developments, and such engineering works as transportation corridors. It is not a suitable map for detailed planning for management of a farm or field or for selecting the exact location of a road or building or other structure, because the soils within an association ordinarily vary in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in this survey have been grouped into six general kinds of landscapes for broad interpretative purposes. Each of the broad groups and the associations in it are described on the following pages. The names and boundaries of the associations do not coincide exactly with those of previously published surveys of adjacent counties because of differences in detail of the general soil map and because of changes in the soil classification system.

Well drained and somewhat excessively drained, loamy and sandy soils that formed in alluvium; on bottom lands

The associations in this group consist of nearly level soils that formed in loamy and sandy alluvium. The

surface layer commonly is loam, fine sandy loam, and loamy fine sand. Only 2 percent of the county is in this group.

The hazard of water erosion is slight. Most areas are subject to flooding. Some of the soils are subject to soil blowing.

Much of the irrigated land in the county is in these associations. Some areas are used for feed and forage crops. Most of the acreage of sandy soils is in native range and hay.

1. Haverson-Munjor association

Deep, nearly level, well drained, loamy soils

This association is on bottom lands adjacent to the White River. Slopes are nearly level, but the surface layer is uneven on some of the lower levels of the flood plain. Elevation differences between levels of the flood plain range from 2 to several feet.

This association covers about 1 percent of the county. It is about 35 percent Haverson soils, 20 percent Munjor soils, and 45 percent soils of minor extent.

Haverson soils typically have a surface layer of grayish brown and dark grayish brown loam. The underlying material is stratified grayish brown loam and pale brown and brown silt loam. Pale brown, very fine sandy loam is at a depth of 53 inches. The entire profile is calcareous.

Munjor soils generally are on a lower flood plain than Haverson soils and are adjacent to the river channel. The surface layer is light brownish gray fine sandy loam. The underlying material is light brownish gray to pale brown stratified sand, very fine sandy loam, and fine sandy loam. The entire profile is calcareous.

Minor soils in this association are Bankard soils in some of the gently undulating areas near the river, Promise soils on some of the higher levels of the stream valley, and Swanboy soils on fans below the adjacent river breaks.

The major soils are low in fertility and in content of organic matter. They have high or moderate available water capacity. Permeability is moderate or moderately rapid. These soils are subject to flooding, but damage generally is minor. Conserving moisture, controlling soil blowing, and improving fertility are the main concerns in management.

About 75 percent of this association is used for crops. The remainder is used mainly for native range and hay. Alfalfa, sorghum, and small grain are the main crops. Some corn also is grown. The major soils have good potential for irrigation. The main enterprise is feed crops for beef cattle. Stringers of native trees and shrubs near the river provide wildlife habitat and winter protection for livestock.

2. Inavale-Cass association

Deep, nearly level, somewhat excessively drained and well drained, sandy and loamy soils

This association is on bottom lands adjacent to the Keya Paha River. Slopes are mostly nearly level, but in places the surface layer is gently undulating and meander scars are common in some areas.

This association covers about 1 percent of the county. It is about 40 percent Inavale soils, 20 percent Cass soils, and 40 percent soils of minor extent.

Inavale soils are somewhat excessively drained. The surface layer typically is grayish brown loamy fine sand. The subsurface layer is light brownish gray fine sand and grayish brown loamy fine sand. The underlying material is light brownish gray and very pale brown fine and medium sand.

Cass soils are well drained. The surface layer is thick. It is dark grayish brown fine sandy loam and very fine sandy loam. The underlying material is mainly stratified calcareous loamy fine sand and fine sand.

Minor in this association are Doger and Dunday soils on the edges of the valleys where slopes are undulating, Lute and Whitelake soils in places that have an uneven surface layer, and Orwet and Wann soils in low, wet areas.

Inavale soils are low in fertility and have low available water capacity. Cass soils are medium in fertility and have moderate available water capacity. These soils have rapid or moderately rapid permeability. Some areas are subject to flooding, but damage generally is minor. Controlling soil blowing, conserving moisture, and maintaining or improving fertility are the main concerns in management.

Most of this association is used for native range and hay and for wildlife habitat. These soils have poor to fair potential for cultivated crops. Alfalfa and small grain are the main crops. Some corn is grown on the Cass soils. Raising beef cattle is the main enterprise. Native trees and shrubs along stream channels provide wildlife habitat and winter protection for livestock.

Well drained, loamy soils; on uplands and high terraces

Only one association is in this group. The soils are mostly nearly level to gently sloping, but they range from nearly level to strongly sloping. The surface layer commonly is loam, and the subsoil is clay loam. About 4 percent of the county is in this group.

Some of the soils are underlain by gravelly sand and are droughty. The other soils have high available water capacity and are well suited to cultivated crops.

Most areas of the droughty soils are in native grass. Many areas of the other soils are in crops.

3. Ree-Murdo association

Nearly level to strongly sloping, well drained, loamy soils that are deep and shallow over gravelly sand

This association is on uplands and on high terraces that extend several miles back from the White River. Slopes are mostly nearly level to moderately sloping, but steeper slopes are on the sides of entrenched drainageways that cut back into the areas and on escarpments that border the high terraces.

This association covers about 4 percent of the county. It is about 50 percent Ree soils, 10 percent Murdo soils, and 40 percent soils of minor extent.

Ree soils are deep and nearly level to strongly sloping. The surface layer is dark grayish brown loam. The upper and middle parts of the subsoil are dark grayish brown and grayish brown clay loam. The lower part of the subsoil is light brownish gray and is calcareous. The underlying material is light brownish gray, calcareous clay loam and loam.

Murdo soils are on the sides of entrenched drainageways and on terrace escarpments. They are shallow

over gravelly sand. The surface layer is thin; it is dark grayish brown loam. The subsoil is dark brown and brown clay loam. The underlying material, to a depth of 18 inches, is light brownish gray and very pale brown, calcareous gravelly loam. Gravelly sand is at a depth of 18 inches.

Minor in this association are Canning soils intermingled with Ree soils, Jerauld and Mosher soils in swales and low areas that have an uneven surface, Keya soils in swales, Lowry and Reliance soils in places where the terraces are mantled with silty material, and Schamber and Westover soils on the sides of ridges and entrenched drainageways or on escarpments on the edges of the association.

The major soils in this association are medium in fertility. Ree soils have high available water capacity and are moderately permeable. Murdo soils are droughty and are poorly suited to crops. Permeability is rapid in the underlying gravelly sand of the Murdo soils. Conserving moisture and controlling water erosion are the main concerns in management.

About half of this association is used for crops. The Ree soils have good potential for all crops commonly grown in the county. Alfalfa, corn, sorghum, oats, and winter wheat are the main crops. Areas in native grass are used for range and hay. General livestock farming and wheat farming are the main enterprises. In places this association is a potential source of sand and gravel.

Well drained and excessively drained, loamy and sandy soils over sandstone; on uplands

The associations in this group consist of nearly level to steep soils that formed in material weathered from underlying sandstone or in sandy material deposited by wind. The surface layer is mostly fine sandy loam but is loamy fine sand or fine sand in places. About 20 percent of the county is in this group.

The soils are very susceptible to soil blowing.

Most areas are in native grass for range and hay. Some of the acreage of the nearly level to gently sloping soils is farmed.

4. Anselmo-Tassel-Valentine association

Deep and shallow, nearly level to steep, well drained and excessively drained, loamy and sandy soils

This association is on uplands underlain by sandstone and partly mantled by eolian sand. Slopes are mostly gently sloping to strongly sloping, but some nearly level and steep areas are on the sides of ridges, peaks or buttes, and entrenched drainageways. Drainage patterns are well defined in much of the area.

This association covers about 11 percent of the county. It is about 35 percent Anselmo soils, 10 percent Tassel soils, 10 percent Valentine soils, and 45 percent soils of minor extent (fig. 2).

Anselmo soils are well drained and nearly level to steep. They formed in eolian sand. The surface layer is dark grayish brown fine sandy loam, and the subsoil is dark grayish brown and grayish brown fine sandy loam. The underlying material is grayish brown and brown fine sandy loam. Pale brown loamy fine sand is at a depth of 44 inches.

Tassel soils are well drained, shallow, and mostly strongly sloping to steep. They are on the sides and tops of ridges and peaks or buttes. The surface layer is dark grayish brown and grayish brown, calcareous fine sandy loam. The underlying material, to a depth of 14 inches, is light gray, calcareous fine sandy loam. Light gray, calcareous sandstone is at a depth of 14 inches.

Valentine soils are excessively drained and undulating to rolling. They formed in eolian sand. The surface layer typically is grayish brown fine sand. The underlying material is pale brown and very pale brown fine sand.

Minor in this association are the Canyon, Doger, Dunday, Elsmere, Holt, Lute, Manter, Ree, Rosebud, Vetal, and Whitelake soils. Canyon soils are on low ridges. Doger and Dunday soils are in the lower part of the landscape near Anselmo and Valentine soils. Elsmere, Lute, and Whitelake soils are on bottom lands and in upland basins or valleys. Holt soils are on wide ridgetops or high tablelands. Manter, Ree, and Rosebud soils are scattered throughout the area and are gently sloping to moderately sloping. Vetal soils are in swales. Areas of Rock outcrop are on the upper sides of some of the ridges and entrenched drainageways.

Anselmo soils are medium in fertility and have moderate available water capacity. Tassel and Valentine soils are low in fertility and are droughty. Permeability is moderately rapid and rapid. Anselmo soils have fair potential for cultivated crops. Tassel soils are too shallow and steep and Valentine soils are too sandy for cultivation. Controlling soil blowing is the main concern in management.

Most of this association is in native grass and is used for range and hay. Some of the Anselmo soils that are nearly level to moderately sloping and some of the minor soils are in cultivation. Alfalfa, corn, and oats are the main crops. Cattle ranching and livestock farming are the main enterprises.

5. Anselmo-Valentine association

Deep, nearly level to rolling, well drained and excessively drained, loamy and sandy soils

This association is on an upland plain that is mantled with eolian sand. Slopes are mostly gently sloping to rolling, but some are nearly level. Steeper slopes are on the sides of ridges and entrenched drainageways. In places the drainage pattern is poorly defined.

This association covers about 4 percent of the county. It is about 45 percent Anselmo soils, 30 percent Valentine soils, and 25 percent soils of minor extent.

Anselmo soils are well drained and nearly level to strongly sloping. The surface layer is dark grayish brown fine sandy loam, and the subsoil is dark grayish brown and grayish brown fine sandy loam. The upper part of the underlying material is grayish brown and brown fine sandy loam. Pale brown loamy fine sand is at a depth of 44 inches.

Valentine soils are excessively drained and undulating to rolling. They have shorter and more convex slopes than Anselmo soils. They typically are loose fine sand throughout. The surface layer is grayish brown. The underlying material is pale brown and very pale brown.

Minor in this association are the Boyd, Chappell,

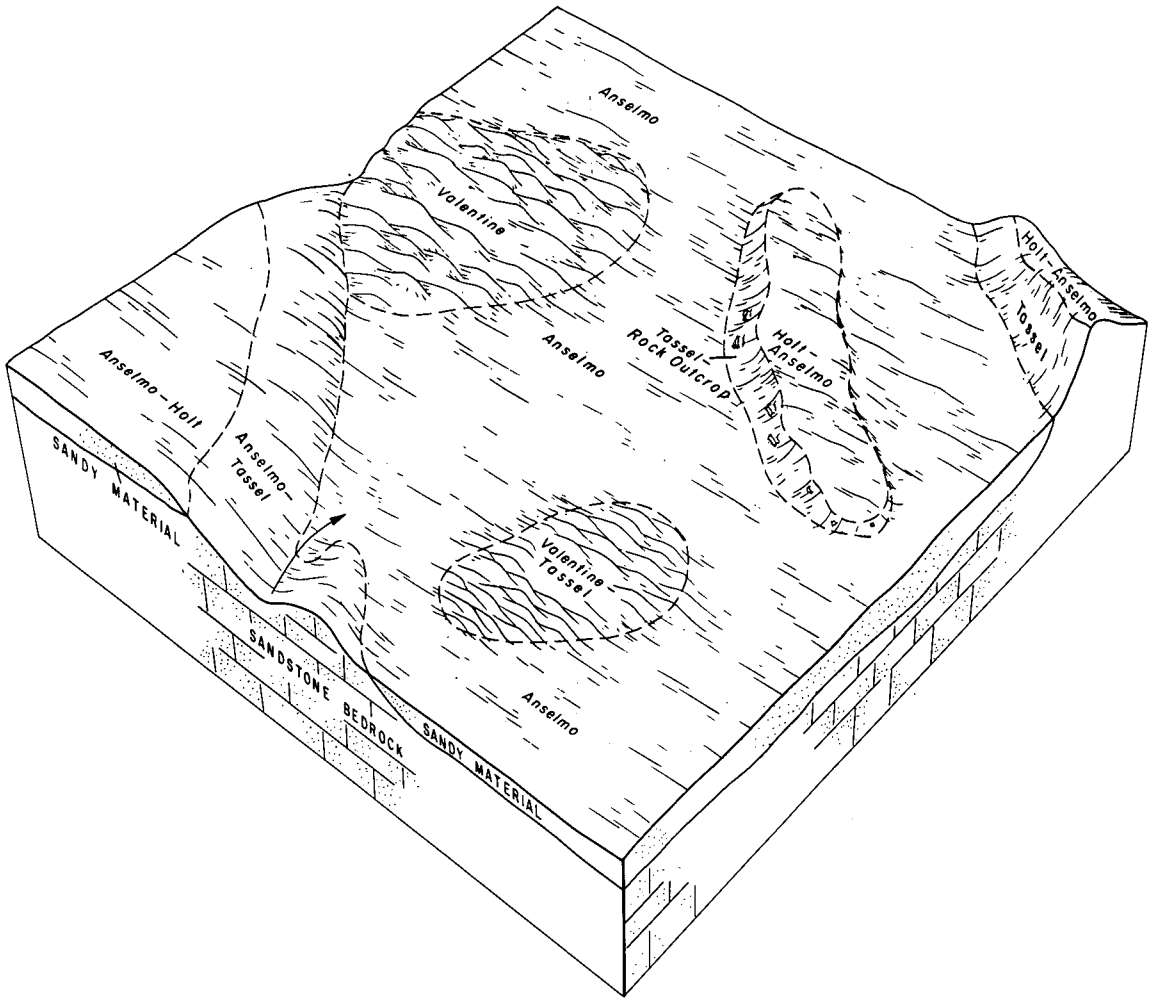

***Figure 2.*—Topography, soils, and underlying material in association 4.**

Doger, Dunday, Elsmere, Lute, Manter, Tassel, Vetal, Wewela, and Whitelake soils. Boyd and Wewela soils are in areas that are underlain by shale at a depth of less than 40 inches. Chappell soils are on stream terraces. Doger and Dunday soils are in the lower part of the landscape near Valentine soils. Elsmere, Lute, and Whitelake soils are on bottom lands and in broad basins. Tassel soils are on the sides of ridges, buttes, and entrenched drainageways. Vetal soils are in swales near Anselmo soils.

Anselmo soils are medium in fertility, have moderate available water capacity, and have fair potential for crops. Valentine soils are low in fertility, are droughty, and are too sandy for cultivation. Permeability is moderately rapid in the Anselmo soil and rapid in the Valentine soil. Controlling soil blowing is a major concern in management.

Most of this association is in native grass and is used for range and hay. Some of the Anselmo soils and some minor soils are used for forage and feed grains. Alfalfa, corn, and oats are the main crops. Cattle ranching is the main enterprise. The Chappell soils are a potential source of sand and gravel.

6. Anselmo-Ronson association

Deep and moderately deep, nearly level to strongly sloping, well drained, loamy soils

This association is on an upland plain that is underlain by calcareous sandstone. Slopes are mostly gently sloping to moderately sloping, but some are nearly level. Some of the ridges are strongly sloping. Drainage patterns are fairly well defined but are poorly defined where slopes are undulating.

This association covers about 1 percent of the county. It is about 50 percent Anselmo soils, 30 percent Ronson soils, and 20 percent soils of minor extent.

Anselmo soils are deep. The surface layer is dark grayish brown fine sandy loam, and the subsoil is dark grayish brown and grayish brown fine sandy loam. The upper part of the underlying material is grayish brown and brown fine sandy loam. Pale brown loamy fine sand is at a depth of 44 inches.

Ronson soils are moderately deep over sandstone and nearly level to gently sloping. The surface layer is dark grayish brown fine sandy loam. The upper part of the underlying material is light gray and white,

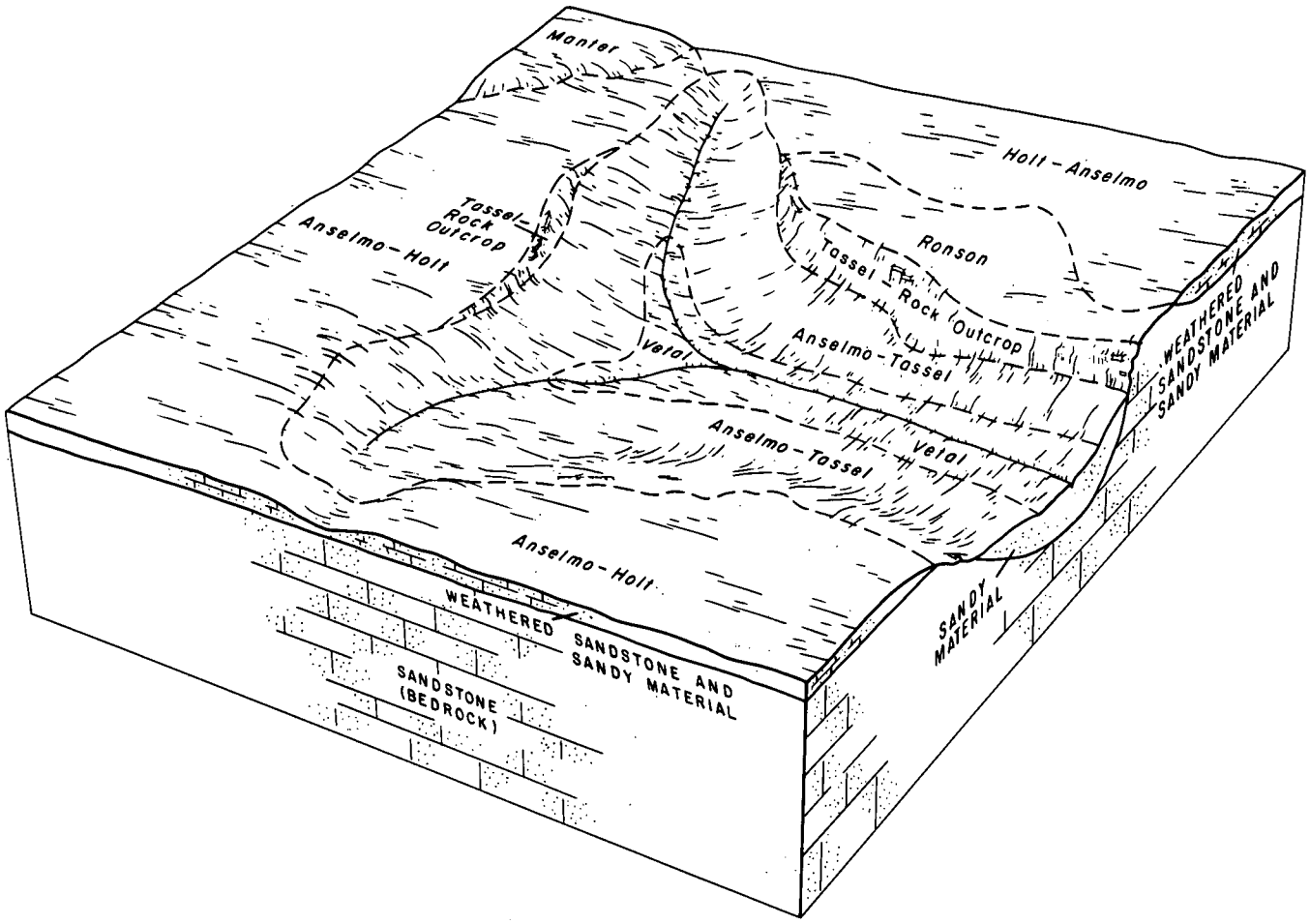

Figure 3.—**Topography, soils, and underlying material in association 7.**

calcareous sandy loam. White, calcareous sandstone is at a depth of 24 inches.

Minor in this association are Doger, Dunday, and Valentine soils where slopes are undulating to gently rolling, Elsmere soils on bottom lands and in broad upland basins, Tassel soils on some of the ridges, and Vetal soils in swales.

Anselmo soils have medium fertility, moderate available water capacity, and fair potential for cultivated crops. Ronson soils have medium to low fertility and low or very low available water capacity. Permeability is moderately rapid. Controlling soil blowing is a major concern in management.

Most of this association is used for native range and hay. Some of the nearly level to gently sloping soils are used for crops. Alfalfa, corn, and oats are the main crops. The Ronson soils are poorly suited to corn because of droughtiness. Cattle ranching is the main enterprise.

7. Anselmo-Holt association

Deep and moderately deep, nearly level to moderately steep, well drained, loamy soils

This association is on a broad drainage divide or tableland that is underlain by sandstone. Slopes are mostly nearly level to moderately sloping, but steep soils are on the sides of ridges and entrenched drainageways that cut back into the area.

This association covers about 4 percent of the county. It is about 45 percent Anselmo soils, 20 percent Holt soils, and 35 percent soils of minor extent (fig. 3).

Anselmo soils are deep and nearly level to moderately steep. The surface layer is dark grayish brown fine sandy loam, and the subsoil is dark grayish brown and grayish brown fine sandy loam. The upper part of the underlying material is grayish brown and brown fine sandy loam. Pale brown loamy fine sand is at a depth of 44 inches.

Holt soils are moderately deep and nearly level to moderately sloping. The surface layer and subsoil are similar to those of the Anselmo soil, but the underlying material is light gray, calcareous sandstone at a depth of 28 inches.

Minor in this association are the Doger, Dunday, Elsmere, Manter, Ree, Ronson, Tassel, Vetal, Wewela, and Whitelake soils. Elsmere and Whitelake soils are in low areas or basins that have a water table. Manter and Ree soils are mostly nearly level to moderately

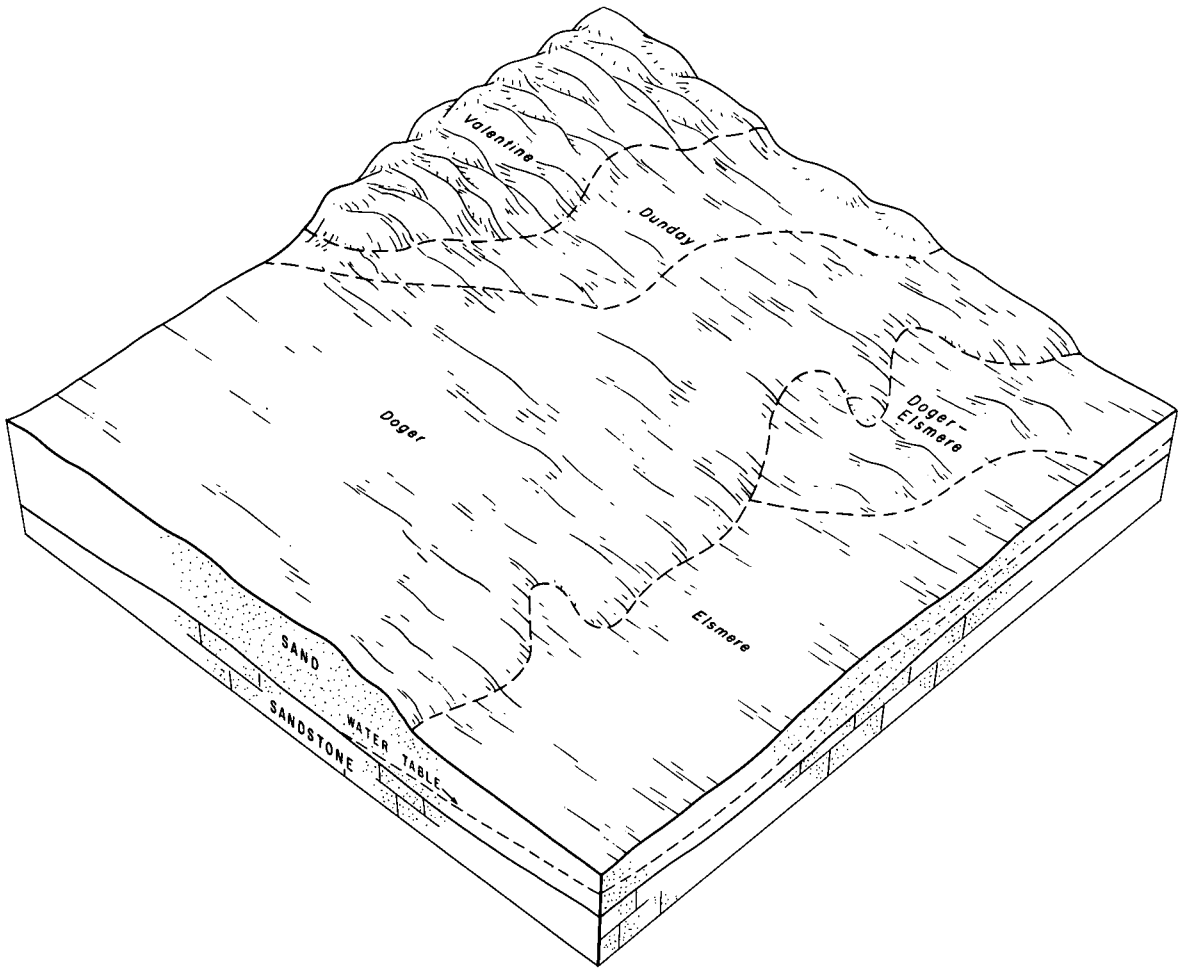

Figure 4.—**Topography, soils, and underlying material in association 8.**

sloping and are scattered throughout the area. Ronson and Tassel soils are near Holt soils in areas that are underlain by sandstone at a moderate to shallow depth. Vetal soils are in swales. Wewela soils are in areas that are underlain by shale at a moderate depth.

Anselmo and Holt soils are medium in fertility and have moderately rapid permeability. Available water capacity is moderate to low. Holt soils are somewhat droughty. Controlling soil blowing is a major concern in management.

About half of this association is used for crops. The Anselmo soils are suitable for alfalfa, corn, and oats. Areas in native grass are used for grazing and hay. Livestock farming and dairy farming are the main enterprises.

Well drained and somewhat poorly drained, sandy and loamy soils; on uplands and bottom lands

Only one association is in this group. The soils are nearly level to undulating and they formed in sandy material deposited by wind or water. The surface layer is loamy fine sand or fine sandy loam. About 4 percent of the county is in this group.

The soils are very susceptible to soil blowing. A seasonal high water table limits some of the soils for crops.

Many areas are in native or tame hay. Some of the areas in native grass are used for range. Some areas are used for feed crops.

8. Doger-Elsmere association

Deep, nearly level to undulating, well drained and somewhat poorly drained, sandy and loamy soils

This association is on an upland plain interspersed with broad basins and bottom lands. Slopes are mostly nearly level to undulating.

This association covers about 4 percent of the county. It is about 50 percent Doger soils, 25 percent Elsmere soils, and 25 percent soils of minor extent (fig. 4).

Doger soils are well drained and nearly level to undulating. They are on slight rises. The surface layer and underlying layer, to a depth of 35 inches, are dark grayish brown loamy fine sand. Grayish brown loamy fine sand is at a depth of 35 inches.

Elsmere soils are somewhat poorly drained and nearly level. They are in basins and on bottom lands.

They have a seasonal water table. The surface layer is dark gray, calcareous fine sandy loam and sandy loam. The next layer is brownish gray, calcareous loamy fine sand. Light gray loamy fine sand is at a depth of 22 inches.

Minor in this association are Dunday and Valentine soils on convex rises above the Doger soils, Orwet and Whitelake soils intermingled with Elsmere soils, and Ronson soils on low ridges near the edges of the association.

The major soils have medium fertility and low or moderate available water capacity. Permeability is rapid. Controlling soil blowing is a major concern in management. Wetness from the seasonal water table limits the use of the Elsmere soil for crops during wet years.

Most of this association is used for native and tame hay or for native range. Some of the Doger and Elsmere soils are used for alfalfa, corn, and oats. Livestock farming is the main enterprise. Shallow wells provide water for livestock. The areas of Elsmere soils are good sites for ground water dugouts.

Well drained, loamy and silty soils over sandstone and siltstone, and deep silty soils; on uplands

The associations in this group consist of moderately deep soils that formed in material weathered from underlying sandstone or siltstone and deep soils that formed in eolian sand and silty loess. Slopes are nearly level to strongly sloping. The surface layer is fine sandy loam to silty clay loam. About 10 percent of the county is in this group.

Control of water erosion is a concern on the gently sloping to strongly sloping soils. The hazard of soil blowing is moderate.

The potential of the soils for crops is fair to high.

9. Manter-Rosebud-Huggins association

Deep and moderately deep, nearly level to strongly sloping, well drained, loamy and silty soils

This association is on an upland plain that is underlain by fine grained sandstone and siltstone, but in places is thinly mantled by stringers of eolian sand. Slopes are mostly nearly level to moderately sloping, but steeper areas are on the sides of ridges and drainageways. Drainage patterns are well defined.

This association covers about 6 percent of the county and contains a complex pattern of soils. It is about 25 percent Manter soils, 10 percent Rosebud soils, 5 percent Huggins soils, and 60 percent soils of minor extent.

Manter soils are deep and mostly nearly level to moderately sloping. They formed in eolian sand. The surface layer is dark grayish brown fine sandy loam, and the upper part of the subsoil is fine sandy loam that is mostly grayish brown and brown. The lower part of the subsoil and the underlying material are pale brown fine sandy loam.

Rosebud soils are moderately deep and gently sloping to strongly sloping. They are underlain by soft sandstone. The surface layer is dark grayish brown loam. The upper part of the subsoil is dark grayish brown clay loam and brown loam. The lower part of the subsoil and the underlying material are pale brown and very pale brown sandy loam. Very pale brown, calcareous soft sandstone is at a depth of 30 inches.

Huggins soils are moderately deep and nearly level to moderately sloping. They are underlain by siltstone and generally are below the Manter and Rosebud soils. The surface layer is dark grayish brown silt loam. The subsoil is grayish brown silty clay loam and silty clay in the upper part and light brownish gray silty clay in the lower part. The upper part of the underlying material is very pale brown clay loam. Calcareous siltstone is at a depth of 28 inches.

Minor in this association are Anselmo, Canyon, Chappell, Dix, Epping, Kadoka, Keya, Ree, Shena, Vetal, Wanblee, Wann, Whitelake, and Wortman soils. Anselmo and Ree soils are scattered throughout the area but generally are near Manter soils. Canyon soils are on ridgetops and on the sides of entrenched drainageways near Rosebud soils. Chappell and Dix soils are on stream terraces. Epping soils are on ridgetops and the sides of entrenched drainageways near Huggins soils. Kadoka and Shena soils are intermingled with or are on landscapes similar to those occupied by the Huggins soils. Keya and Vetal soils are in swales. Wanblee, Whitelake, and Wortman soils are along drainageways, on foot slopes, and on flats where the surface layer is uneven. Wann soils are on bottom land.

The major soils are medium in fertility and have moderately slow to moderately rapid permeability in the subsoil. Manter soils have moderate or high available water capacity. Rosebud and Huggins soils have low available water capacity and are somewhat droughty. Controlling water erosion and soil blowing and conserving moisture are the main concerns in management.

About half of this association is in native grass and is used for range and hay. The remainder is used for annual crops and tame hay and pasture. The Manter soils are suitable for alfalfa, corn, and oats, but the Rosebud and Huggins soils are somewhat droughty. The Chappell and Dix soils are a potential source of sand and gravel.

10. Reliance association

Deep, nearly level to moderately sloping, well drained, silty soils

This association is on a smooth upland that is mantled by silty loess. Slopes are long and mostly nearly level and gently sloping, but they are moderately sloping on the sides of some ridges and drainageways. Drainage patterns are well defined.

This association covers about 4 percent of the county. It is about 85 percent Reliance soils and 15 percent soils of minor extent.

Reliance soils have a surface layer of dark grayish brown silty clay loam. The subsoil is dark brown and brown silty clay loam in the upper part and pale brown, calcareous silty clay loam in the lower part. The upper part of the underlying material is pale brown, calcareous silty clay loam. Light brownish gray, calcareous silt loam is at a depth of 42 inches.

Minor in this association are Millboro soils on the lower part of the landscape, especially in the northern part of the association; Mosher and Onita soils in swales; Ree soils scattered throughout the southern

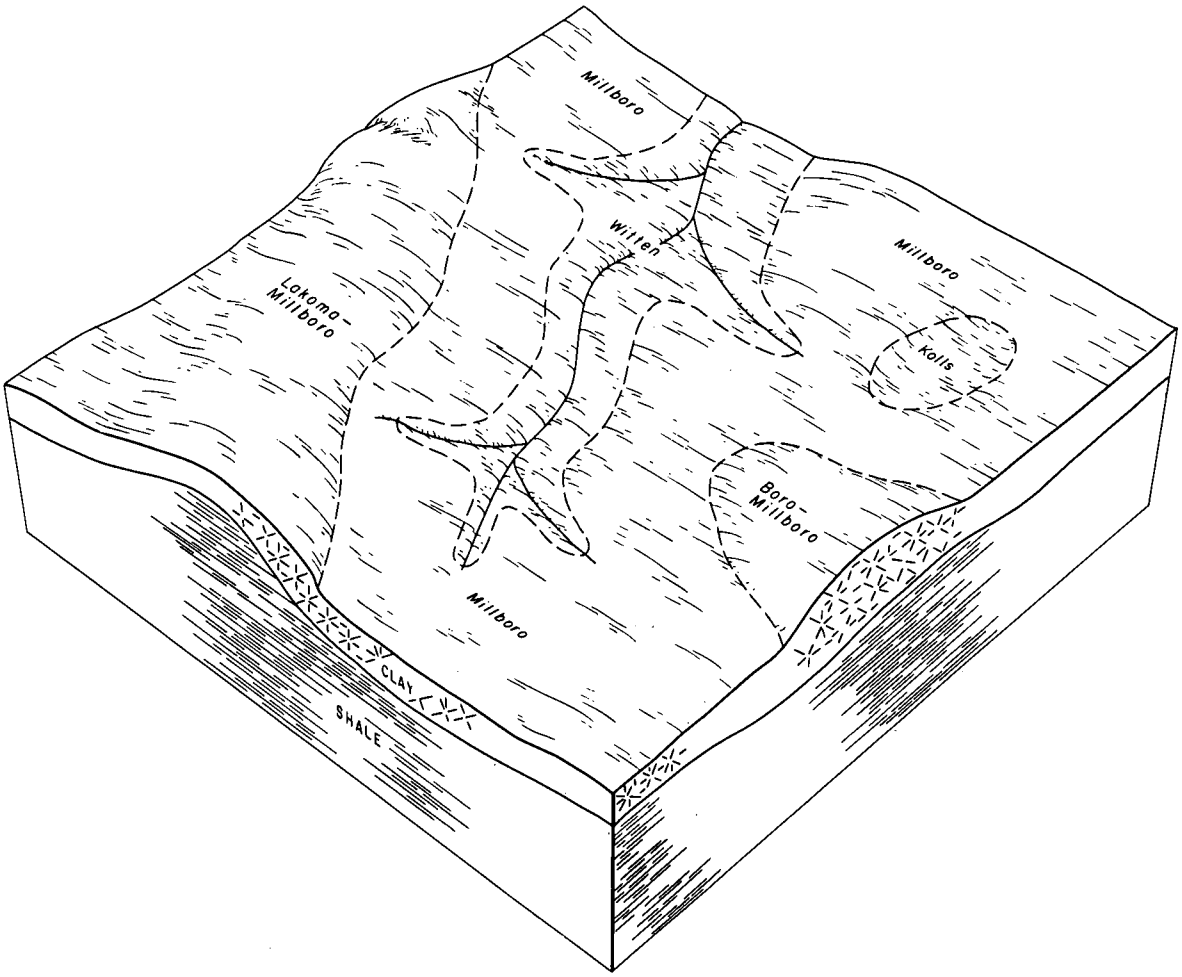

Figure 5.—**Topography, soils, and underlying material in association 11.**

part of the association; and Scott soils in closed depressions.

Reliance soils have medium fertility and high available water capacity. Permeability is moderately slow. Controlling water erosion and conserving moisture are the main concerns in management.

Most of this association is used for crops. Alfalfa, corn, oats, sorghum, and winter wheat are the main crops. The soils have high potential for all crops commonly grown in the county. Livestock farming and wheat farming are the main enterprises.

Well drained, clayey soils over soft clay shale and loamy soils; on uplands

The associations in this group consist mainly of deep to shallow, nearly level to steep, clayey soils that formed in material weathered from underlying soft shale either in place or transported locally by wind or water. About 60 percent of the county is in this group.

The most extensive area of winter wheat in the county is in this group. Some associations are used only for range. Most of the acreage of deep, nearly level to moderately sloping soils is in crops. Almost all of the acreage of the shallow to moderately deep soils is in native grass for range.

11. Millboro-Lakoma association

Deep and moderately deep, nearly level to strongly sloping, well drained, clayey soils

This association is on a smooth upland plain that is underlain by soft, clayey shale. Slopes are long and mostly nearly level to moderately sloping, but steeper slopes are on the sides of some ridges and along entrenched drainageways. Drainage patterns are well defined.

This association covers 46 percent of the county. It is about 45 percent Millboro soils, 15 percent Lakoma soils, and 40 percent soils of minor extent (fig. 5).

Millboro soils are deep and nearly level to moderately sloping. The surface layer is dark grayish brown silty clay. The subsoil is dark grayish brown and grayish brown clay in the upper part and grayish brown, calcareous silty clay in the lower part. The underlying material is grayish brown and light yellowish brown, calcareous silty clay.

Lakoma soils are moderately deep and mostly moderately sloping to strongly sloping. They are on the upper sides of ridges and entrenched drainageways. The surface layer is dark grayish brown silty clay, and the subsoil is grayish brown clay. Below the subsoil is a thin layer of light brownish gray, shaly clay. Light

brownish gray shale is at a depth of 28 inches. The entire profile is calcareous.

Minor in this association are Boro, Boyd, Bridgeport, Carter, Erd, Hurley, Kolls, Mosher, Murdo, Okaton, Promise, Ree, Reliance, and Witten soils. Boro and Boyd soils are on the upper sides of some ridges. Bridgeport soils are on low terraces and bottom lands. Carter, Erd, Hurley, and Mosher soils are on stream terraces and in swales. Kolls soils are in closed depressions. Murdo soils are on gravelly ridges. Okaton soils are on the sides of some of the steeper ridges and entrenched drainageways. Promise soils are scattered throughout the area on landscapes similar to those occupied by the Millboro soils. Ree and Reliance soils are on smooth, wide ridgetops in the higher elevations of the association. Witten soils are in swales.

Millboro soils have medium fertility and low or moderate available water capacity. Lakoma soils have low fertility and very low available water capacity. Permeability is slow. Controlling water erosion and soil blowing and conserving moisture are major concerns in management.

Most of this association is used for crops. These soils, especially the Millboro soils, are suitable for alfalfa, oats, sorghum, and winter wheat. Livestock farming and wheat farming are the main enterprises. In places the Murdo soils are a potential source of sand and gravel.

12. Okaton-Manter association

Shallow and deep, nearly level to very steep, well drained, clayey and loamy soils

This association is on a series of deeply entrenched drainageways leading to the Keya Paha River and high plateaus or tablelands. Slopes are strongly sloping to very steep in the rough, broken areas along the drainageways, but are nearly level to moderately sloping on the plateaus.

This association covers about 5 percent of the county. It is about 35 percent Okaton soils, 25 percent Manter soils, and 40 percent soils of minor extent.

Okaton soils are shallow and strongly sloping to very steep. They are on the sides of ridges, buttes, and entrenched drainageways. The surface layer is thin. It is grayish brown silty clay that is underlain by grayish brown silty clay and light brownish gray shaly clay. Light brownish gray and light gray shale is at a depth of 12 inches. The entire profile is calcareous.

Manter soils are deep and nearly level to steep. They formed in sandy deposits and are on the plateaus and in the higher part of the rough, broken areas. The surface layer is dark grayish brown fine sandy loam. The upper part of the subsoil is grayish brown and brown fine sandy loam. The lower part of the subsoil and the underlying material are pale brown fine sandy loam.

Minor in this association are Anselmo, Boyd, Bridgeport, Dix, Lakoma, Promise, Ree, Tassel, and Vetal soils. Anselmo and Ree soils are intermingled with Manter soils on the plateaus. Boyd, Lakoma, and Promise soils are below Okaton soils in the rough, broken areas. Bridgeport soils are on narrow bottom lands. Dix soils are on gravelly ridges. Tassel soils and areas of Rock outcrop are on the upper sides of Turtle Butte. Vetal soils are in swales on the high plateaus.

Okaton soils are low in fertility, have very low available water capacity, and are too shallow and too steep for cultivation. Manter soils have medium fertility and moderate available water capacity. Controlling water erosion and soil blowing is the main concern of management.

Most of this association is used for range. Some areas of the Manter soils and some minor soils are used for crops. Alfalfa, corn, and small grain are the main crops. Cattle ranching and livestock farming are the main enterprises. A few dairy farms also are in this association. The Dix soils are a potential source of sand and gravel.

13. Sansarc-Opal association

Shallow and moderately deep, strongly sloping to steep, well drained, clayey soils

This association is on a series of ridges and deeply entrenched drainageways in rough, broken areas along the White River and its principal tributaries. Slopes are mostly strongly sloping to steep but are gently sloping to moderately sloping on some of the ridges, foot slopes, and around the heads of some of the drainageways. Gullies are in many of the small drainageways that lace the landscape. Drainage patterns are well defined.

This association covers about 7 percent of the county. It is about 45 percent Sansarc soils, 20 percent Opal soils, and 35 percent soils of minor extent.

Sansarc soils are shallow and generally are in the higher part of the landscape on narrow ridgetops and the upper sides of ridges and entrenched drainageways. The surface layer is thin. It is grayish brown clay that is underlain by olive gray clay and shaly clay. Gray and olive gray shale is at a depth of 17 inches. The soil above the shale and the upper part of the shale are calcareous.

Opal soils are moderately deep over shale and generally are less steep than Sansarc soils. They are on some of the ridgetops and on the mid and lower parts of the landscape. The surface layer is dark gray and dark grayish brown clay. The subsoil and the upper part of the underlying material are gray, calcareous clay. Light brownish gray shale is at a depth of 25 inches.

Minor in this association are Millboro and Ree soils on some of the higher and smoother ridgetops near the edge of this association; Murdo and Schamber soils on gravelly ridges and terrace escarpments; Okaton soils in the higher part of the landscape near Sansarc soils; and Swanboy soils on foot slopes.

The major soils are too shallow or too steep for crops. In addition, available water capacity is very low or low and Sansarc soils have low fertility. Controlling water erosion is a major concern in management.

All of this association is in native grass and is used for range. This association also has fair to good potential for rangeland wildlife habitat. Cattle ranching is the main enterprise.

14. Okaton-Rock outcrop association

Shallow, moderately steep to very steep, well drained, clayey soils, and Rock outcrop

This association is on several buttes that rise above

the surrounding shale plain. Outcrops of strongly cemented sandstone commonly are on the upper sides of the buttes. Slopes are mostly steep or very steep and some of the sandstone is exposed and forms an almost vertical rimrock. Boulder-sized fragments of the sandstone commonly are on the surface near areas of Rock outcrop.

This association covers about 2 percent of the county. It is about 60 percent Okaton soils, 20 percent Rock outcrop, and 20 percent soils of minor extent.

Okaton soils are mostly moderately steep to very steep and are shallow over shale. The surface layer is thin. It is grayish brown silty clay that is underlain by grayish brown silty clay and light brownish gray shaly clay. Light brownish gray and light gray shale is at a depth of 12 inches. The entire profile is calcareous.

The Rock outcrop part consists of ledges of strongly cemented sandstone and is on the higher part of the landscape.

Minor in this association are Lakoma soils in the mid and lower parts of the landscape below Okaton soils, Promise soils on foot slopes, and Ree and Reliance soils on buttes and ridgetops.

Okaton soils have low fertility and very low available water capacity. They are too shallow and too steep for crops and are highly susceptible to water erosion if the grass cover is disturbed or removed.

All of this association is used for range. It has fair potential for rangeland wildlife habitat. Cattle ranching is the main enterprise. The Rock outcrop areas are a source of crushed rock for road construction.

Descriptions of the soils

This section describes the soil series and mapping units in Tripp County. A soil series is described in detail, and then, briefly, each mapping unit in that series. Unless specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. Color terms are for dry soil unless otherwise stated. The profile in the series description is representative for mapping units in that series. If the profile of a given mapping unit differs from the one described as representative of the series, these differences are stated in the mapping unit description or are apparent in the name of the mapping unit.

Preceding the name of each mapping unit is a symbol. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and range site in which the mapping unit has been placed. The page for the description of each capability unit or pasture suitability group can be found by referring to the "Guide to mapping units" at the back of this survey.

The names of some soils do not agree fully with those appearing in previously published surveys of adjacent counties. This is due to change in concepts of soil series in the application of the soil classification system.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the "Glossary" at the end of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the "Soil Survey Manual" (*8*).

Anselmo series

The Anselmo series consists of deep, nearly level to steep, well drained soils on uplands. These soils formed in eolian material. The native vegetation is mainly mid and tall grasses.

In a representative profile (fig. 6) the surface layer is dark grayish brown fine sandy loam about 10 inches thick. The subsoil is fine sandy loam about 15 inches thick; the upper part is dark grayish brown and the lower part is grayish brown. The underlying material to a depth of 44 inches is grayish brown and brown fine sandy loam. Pale brown loamy fine sand is at a depth of 44 inches.

Anselmo soils are medium in fertility and moderate in content of organic matter. Permeability is moderately rapid, and available water capacity is moderate.

About half of the acreage of these soils is in cultivated crops. Many areas remain in native grass and are used for grazing and hay.

Representative profile of Anselmo fine sandy loam, 3 to 6 percent slopes, in cultivation, 125 feet north and 2,115 feet west of the southeast corner of sec. 27, T. 98 N., R. 78 W.:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak thick platy structure parting to weak medium and coarse granular; soft, very friable; neutral; abrupt smooth boundary.

A12—6 to 10 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; soft, very friable; slightly acid; clear smooth boundary.

B21—10 to 15 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; slightly hard, friable; slightly acid; clear smooth boundary.

B22—15 to 25 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, friable; slightly acid; gradual wavy boundary.

C1—25 to 36 inches; grayish brown (10YR 5/2)

TABLE 1.—*Acreage and proportionate extent of the soils*

Map symbol	Soil name	Acres	Percent	Map symbol	Soil name	Acres	Percent
AaB2	Anselmo loamy fine sand, 0 to 9 percent slopes, eroded	3,930	0.4	MaB	Manter fine sandy loam, 3 to 9 percent slopes	13,200	1.3
AbB	Anselmo fine sandy loam, 3 to 6 percent slopes	16,130	1.6	MfE	Manter-Anselmo fine sandy loams, 15 to 30 percent slopes	11,810	1.1
AbC	Anselmo fine sandy loam, 6 to 9 percent slopes	23,020	2.2	Mh	Marsh	195	(1)
AbD	Anselmo fine sandy loam, 9 to 15 percent slopes	2,780	0.3	MoA	Millboro silty clay, 0 to 3 percent slopes	57,590	5.6
AhC	Anselmo-Holt fine sandy loams, 3 to 9 percent slopes	14,420	1.4	MoB	Millboro silty clay, 3 to 6 percent slopes	102,600	9.9
AtD	Anselmo-Tassel fine sandy loams, 10 to 20 percent slopes	24,600	2.4	MoC	Millboro silty clay, 6 to 9 percent slopes	17,190	1.7
AvA	Anselmo-Vetal fine sandy loams, 0 to 3 percent slopes	18,430	1.8	Mr	Mosher silt loam	6,270	0.6
Ba	Bankard complex	805	0.1	Ms	Mosher-Jerauld silt loams	3,420	0.3
BmC	Boro-Millboro silty clays, 5 to 9 percent slopes	25,420	2.4	Mu	Munjor fine sandy loam	1,880	0.2
BnC	Boyd clay, 5 to 9 percent slopes	10,740	1.0	OAF	Okaton association, 25 to 40 percent slopes	5,630	0.5
BOD	Boyd-Okaton association, 9 to 25 percent slopes	20,660	2.0	OBE	Okaton-Lakoma association, 15 to 40 percent slopes	22,870	2.2
Bp	Bridgeport complex	4,120	0.4	OcF	Okaton-Rock outcrop complex, 25 to 60 percent slopes	10,570	1.0
Bt	Bridgeport complex, channeled	925	0.1	On	Onita silt loam	1,650	0.2
CaB	Canning loam, 2 to 5 percent slopes	400	(1)	Oo	Onita-Mosher silt loams	2,890	0.3
CbD	Canning-Murdo loams, 6 to 15 percent slopes	6,840	0.7	OpC	Opal clay, 3 to 9 percent slopes	1,160	0.1
Cc	Carter silty clay loam	10,010	1.0	OsE	Opal-Sansarc clays, 9 to 25 percent slopes	6,690	0.6
Cd	Cass fine sandy loam	2,040	0.2	Ow	Orwet loam	640	0.1
ChA	Chappell fine sandy loam, 0 to 3 percent slopes	4,450	0.4	PrA	Promise clay, 0 to 3 percent slopes	5,900	0.6
CnC	Chappell-Dix fine sandy loams, 6 to 9 percent slopes	2,940	0.3	PrB	Promise clay, 3 to 6 percent slopes	6,000	0.6
DaA	Dix fine sandy loam, 0 to 3 percent slopes	265	(1)	PrC	Promise clay, 6 to 9 percent slopes	3,760	0.4
DbD	Dix soils, 9 to 18 percent slopes	3,730	0.4	PsA	Promise clay, channeled, 0 to 2 percent slopes	10,150	1.0
DgB	Doger loamy fine sand, 0 to 6 percent slopes	46,400	4.5	PtA	Promise clay, loamy substratum, 0 to 2 percent slopes	1,310	0.1
DmA	Doger-Elsmere complex, 0 to 3 percent slopes	13,930	1.3	RaA	Ree loam, 0 to 3 percent slopes	12,670	1.2
DnC2	Dunday loamy fine sand, 3 to 9 percent slopes, eroded	19,660	1.9	RaB	Ree loam, 3 to 6 percent slopes	11,860	1.1
DuC	Dunday-Doger loamy fine sands, 3 to 9 percent slopes	18,800	1.8	RaC	Ree loam, 6 to 9 percent slopes	12,160	1.2
Em	Elsmere fine sandy loam	6,980	0.7	RaD	Ree loam, 9 to 15 percent slopes	3,630	0.3
EpE	Epping soils, 12 to 25 percent slopes	2,000	0.2	ReA	Reliance silty clay loam, 0 to 3 percent slopes	17,670	1.7
Er	Erd clay	4,550	0.4	ReB	Reliance silty clay loam, 3 to 6 percent slopes	25,030	2.4
Es	Erd-Hurley complex	3,810	0.4	ReC	Reliance silty clay loam, 6 to 9 percent slopes	7,770	0.7
Ha	Haverson soils	3,540	0.3	ReC2	Reliance silty clay loam, 6 to 9 percent slopes, eroded	9,200	0.9
HbA	Holt-Anselmo fine sandy loams, 0 to 3 percent slopes	5,920	0.6	RfA	Ronson fine sandy loam, 0 to 4 percent slopes	1,630	0.2
HgA	Huggins silt loam, 0 to 3 percent slopes	1,790	0.2	RoB	Ronson-Tassel fine sandy loams, 0 to 6 percent slopes	4,490	0.4
HkB	Huggins-Kadoka silt loams, 3 to 9 percent slopes	3,430	0.3	RsB	Rosebud loam, 3 to 6 percent slopes	960	0.1
Hr	Hurley silt loam	5,300	0.5	RuC	Rosebud-Canyon loams, 6 to 9 percent slopes	5,150	0.5
Ia	Inavale loamy fine sand	2,460	0.2	RuD	Rosebud-Canyon loams, 9 to 15 percent slopes	2,020	0.2
Ic	Inavale complex, channeled	1,820	0.2	SAE	Sansarc-Opal association, 15 to 40 percent slopes	39,560	3.8
KaA	Kadoka silt loam, 0 to 3 percent slopes	610	0.1	ScF	Sansarc-Shale outcrop complex, 25 to 40 percent slopes	1,290	0.1
KbD	Kadoka-Epping silt loams, 6 to 12 percent slopes	830	0.1	ShE	Schamber-Murdo complex, 15 to 40 percent slopes	5,450	0.5
Ke	Keya silt loam	1,120	0.1	So	Scott silt loam	790	0.1
Ko	Kolls clay	4,070	0.4	SsB	Shena silt loam, 0 to 9 percent slopes	1,470	0.1
LkC	Lakoma-Millboro silty clays, 5 to 9 percent slopes	58,110	5.6	Sw	Swanboy clay	9,670	0.9
LoD	Lakoma-Okaton silty clays, 9 to 15 percent slopes	45,920	4.4	TaE	Tassel fine sandy loam, 9 to 40 percent slopes	2,890	0.3
LwA	Lowry silt loam, 0 to 4 percent slopes	730	0.1	TrF	Tassel-Rock outcrop complex, 15 to 40 percent slopes	5,730	0.5
MaA	Manter fine sandy loam, 0 to 3 percent slopes	5,540	0.5				

TABLE 1.—*Acreage and proportionate extent of the soils*—Continued

Map symbol	Soil name	Acres	Percent	Map symbol	Soil name	Acres	Percent
VaD	Valentine fine sand, 6 to 15 percent slopes	14,300	1.4	WgA	Wewela fine sandy loam, 0 to 3 percent slopes	5,060	0.5
VdC	Valentine-Dunday complex, 3 to 9 percent slopes	18,500	1.8	WgB	Wewela fine sandy loam, 3 to 6 percent slopes	8,580	0.8
VnD	Valentine-Tassel complex, 6 to 15 percent slopes	5,890	0.6	Wh	Whitelake fine sandy loam	12,250	1.2
Vt	Vetal fine sandy loam	6,140	0.6	Wk	Whitelake-Lute fine sandy loams	4,760	0.5
Wa	Wanblee-Wortman silt loams	620	0.1	Wn	Witten silty clay	20,960	2.0
Wb	Wann fine sandy loam	4,480	0.4	Wo	Wortman silt loam	1,060	0.1
WeE	Westover loam, 9 to 25 percent slopes	2,950	0.3		Water < 40 acres	935	0.1
WfA	Wewela loamy fine sand, 0 to 4 percent slopes	1,320	0.1		Gravel pit	95	(1)
					Quarry	140	(1)
					Total	1,036,480	100.0

[1] Less than 0.1 percent.

fine sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable; slightly acid; gradual wavy boundary.

C2—36 to 44 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable; slightly acid; gradual wavy boundary.

C3—44 to 60 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grained; loose; few fine calcareous fragments; slightly acid.

The A horizon is dark grayish brown or very dark grayish brown and is 6 to 12 inches thick. In eroded areas it is loamy fine sand. The B horizon commonly is fine sandy loam, but in places the lower part is loamy fine sand. Some pedons have a buried A horizon within the C horizon. In places soft bedded sandstone is at a depth of 40 to 60 inches.

Anselmo soils are mapped with or are near Chappell, Doger, Holt, Manter, Ronson, Vetal, and Whitelake soils. They are less gravelly in the C horizon than Chappell soils and are less sandy than Doger soils. They are deeper over sandstone than Holt and Ronson soils. Anselmo soils have little or no increase in clay content from the A horizon to the B horizon, as Manter soils do. Anselmo soils have a thinner A horizon than Vetal soils and contain less clay and sodium in the B horizon than Whitelake soils.

AaB2—Anselmo loamy fine sand, 0 to 9 percent slopes, eroded. Areas of this soil are rectangular in shape and are 40 to 100 acres in size. In places the boundary coincides with old field boundaries.

The surface layer is uneven in places because of small hummocks of windblown sand. The hummocks have an elevation differential of 2 to 3 feet within a distance of a few feet. In much of the area soil blowing has removed part or all of the original surface layer while in other places windblown sand has accumulated in deposits as much as 3 feet thick. In a few severely eroded spots the soil material has been removed to the underlying sandstone.

Included with this soil in mapping are small areas of Vetal soils in swales.

Runoff is slow, and most of the rainfall enters the soil. The hazard of soil blowing is severe and fertility is low because of erosion. Controlling soil blowing and maintaining fertility are the main concerns in management.

Most areas of this soil are now in native grass and are used for grazing. Some areas have been smoothed and seeded to tame grasses or alfalfa and are used for hay. Capability unit VIe–6; Sandy range site.

AbB—Anselmo fine sandy loam, 3 to 6 percent slopes. Areas of this soil are irregular in shape and are 30 to 200 acres or more in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Doger, Holt, Manter, and Vetal soils. Holt and Manter soils are on some of the convex ridges. Doger soils are in the lower part of some of the side slopes. Vetal soils are in swales. Sand blowouts and small wet areas are in some places and are shown on the soil map by spot symbols.

Runoff is slow, and most of the rainfall enters the soil. This soil is easy to work, but it is subject to soil blowing. Controlling soil blowing is the main concern in management.

About half of the acreage is in cultivated crops, mainly alfalfa, corn, and oats. Areas in native grass are used for grazing and hay. Capability unit IIIe–8; Sandy range site.

AbC—Anselmo fine sandy loam, 6 to 9 percent slopes. Areas of this soil are irregular in shape and are 30 to 200 acres or more in size. This soil has a thinner surface layer and subsoil than the soil described as representative of the series.

Included with this soil in mapping are small areas of Doger, Holt, Manter, and Vetal soils. Holt and Manter soils are on some of the convex ridges. Doger soils are on the lower part of side slopes in some mapped areas. Vetal soils are in swales. Outcrops of sandstone on or near ridgecrests and sand blowouts are in some areas and are shown on the soil map by spot symbols.

Runoff is slow to medium, and most of the rainfall enters the soil. This soil is easy to work, but it is

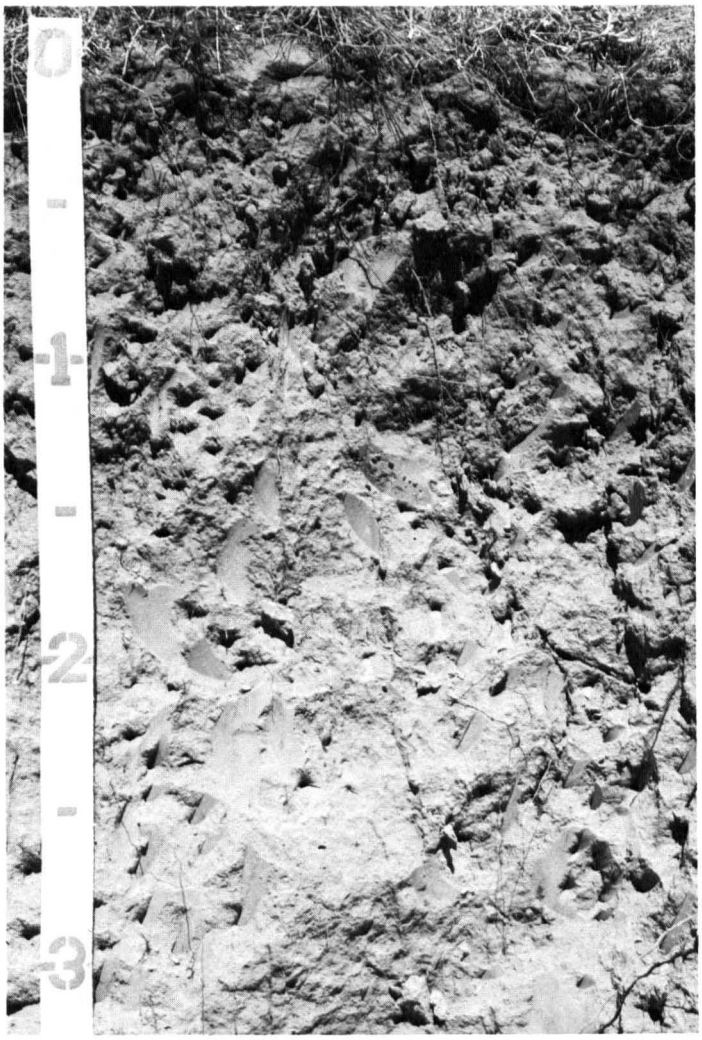

Figure 6.—**Representative profile of Anselmo fine sandy loam, 3 to 6 percent slopes.**

subject to soil blowing and water erosion. Controlling soil blowing and water erosion is the main concern in management.

Most areas of this soil are in native grass and are used for grazing and hay. Alfalfa, corn, and oats are the main crops in cultivated areas. Capability unit IVe–8; Sandy range site.

AbD—Anselmo fine sandy loam, 9 to 15 percent slopes. Areas of this soil are mostly long and narrow. They are 100 to 200 acres in size. This soil is mostly strongly sloping, but steeper areas are on the sides of entrenched drainageways. It has a thinner surface layer and subsoil than the soil described as representative of the series.

Included with this soil in mapping are small areas of Boyd, Dix, and Vetal soils. Boyd soils are on the lower part of the landscape on the shoulders of drainageways. Dix soils are around the heads of drainageways and are shown on the soil map by the gravel spot symbol. Vetal soils are in swales. Outcrops of sandstone are on or near some ridgecrests and are also shown on the soil map by a spot symbol.

Runoff is medium. This soil is subject to soil blowing and water erosion if an adequate cover of grass is not maintained. Controlling soil blowing and water erosion is the main concern in management.

Most areas of these soils are in native grass and are used for grazing. A few small areas are used for hay. Bur oak and ash grow in some areas and provide cover for livestock and wildlife. Capability unit VIe–6; Sandy range site.

AhC—Anselmo-Holt fine sandy loams, 3 to 9 percent slopes. Areas of this complex are irregular in shape and are 30 to more than 200 acres in size. This complex is about 50 percent Anselmo soil, 40 percent Holt soil, and 10 percent other soils. The Anselmo soil is mostly in the mid and lower parts of the landscape and has slopes that are mostly less than 6 percent. The Holt soil is on the tops and upper sides of ridges where slopes are more convex and are mostly 6 to 9 percent. The Holt soil has a thinner surface layer and is shallower to lime than the soil described as representative of the Holt series.

Included with these soils in mapping are Tassel and Vetal soils. Vetal soils are the most extensive and are in swales. Tassel soils are on some of the ridges. Outcrops of sandstone are on some of the higher ridges and are shown on the soil map by a spot symbol.

Runoff is slow to medium. These soils are easy to work, but they are subject to soil blowing and water erosion. Controlling soil blowing and water erosion is the main concern in management.

About half of the acreage is in cultivated crops, mainly corn, oats, and alfalfa. Areas in native grass are used for grazing and hay. Anselmo part in capability unit IIIe–8, Holt part in capability unit IVe–8; Sandy range site.

AtD—Anselmo-Tassel fine sandy loams, 10 to 20 percent slopes. This complex of strongly sloping to moderately steep soils is on the sides of buttes or on ridges. Areas are irregular in shape and are 100 to more than 300 acres in size. It is about 55 percent Anselmo soil, 20 percent Tassel soil, and 25 percent other soils. The Anselmo soil is in the mid and lower parts of the landscape and the Tassel soil is on the ridgetops and buttes in the higher part of the landscape (fig. 7). The Anselmo soil has a thinner surface layer and subsoil than the soil described as representative of the Anselmo series. The Tassel soil in this complex has the profile described as representative of the Tassel series.

Included with these soils in mapping are small areas of Doger, Ronson, and Vetal soils. Ronson soils are the most extensive and are in the higher part of the landscape near Tassel soils. Doger soils are on some of the foot slopes. Vetal soils are in swales. Outcrops of sandstone are on some of the ridges. Sand blowouts are in some areas and are shown on the soil map by a spot symbol.

Runoff is medium. The hazard of soil blowing and water erosion is too severe for cultivation. Controlling soil blowing and water erosion is the main concern in management.

Most areas of this complex are in native grass and are used for grazing. Some of the less sloping Anselmo

Figure 7.—**An area of Anselmo-Tassel fine sandy loams, 10 to 20 percent slopes.**

soils are used for hay. Capability unit VIe–6; Anselmo part in Sandy range site, Tassel part in Shallow range site.

AvA—Anselmo-Vetal fine sandy loams, 0 to 3 percent slopes. This complex is on very slight rises or undulations and in numerous swales. Areas are irregular in shape and are 20 to 250 acres in size. It is about 55 percent Anselmo soil, 30 percent Vetal soil, and 15 percent other soils. The Anselmo soil is on rises and the Vetal soil is in swales. The Anselmo soil has a thicker surface layer and subsoil than the soil described as representative of the Anselmo series.

Included with these soils in mapping are Holt and Manter soils. Holt soils are on some of the higher rises. Manter soils are intermingled with Anselmo soils. Small wet spots and small gumbo or scabby spots are in some areas and are shown on the soil map by spot symbols.

Runoff is slow, and most of the rainfall enters the soil. In some years the Vetal soil receives additional moisture in the form of runoff from adjacent soils. These soils are easy to work, but they are subject to soil blowing. Controlling soil blowing is the main concern in management.

Most areas of this complex are in cultivated crops, mainly alfalfa, corn, and oats. Areas in native grass are used for grazing and hay. Capability unit IIIe–7; Sandy range site.

Bankard series

The Bankard series consists of deep, nearly level, well drained soils on bottom lands. These soils formed in sandy alluvium. The native vegetation is mainly mid and tall grasses. Native trees and shrubs commonly are near stream channels.

In a representative profile the upper part of the surface layer is light brownish gray and light gray silty clay loam about 3 inches thick, and the lower part is light brownish gray and pale brown loamy fine sand about 9 inches thick. The underlying material to a depth of 30 inches is pale brown, light gray, and very pale brown sand. Next is a layer of light brownish gray loamy very fine sand about 15 inches thick. Light gray loam is at a depth of 45 inches. The entire profile is calcareous.

Bankard soils are low in fertility and in content of organic matter. Permeability is rapid, and available water capacity is low. Most areas are subject to flooding.

All areas of these soils are in native vegetation and are used for grazing. The scattered native trees and shrubs provide cover for wildlife and winter protection for livestock.

Representative profile of Bankard silty clay loam in an area of Bankard complex, in native grass, 3,400

feet north and 1,900 feet east of the southwest corner of sec. 26, T. 103 N., R. 76 W.:

A11—0 to 2 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; moderate medium platy structure parting to moderate fine blocky; hard, firm, slightly sticky and slightly plastic; slight effervescence; moderately alkaline; abrupt smooth boundary.

A12—2 to 3 inches; light gray (10YR 7/2) and light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak fine blocky structure parting to weak fine and medium platy; slightly hard, friable, slightly sticky and slightly plastic; strong effervescence; moderately alkaline; abrupt smooth boundary.

A13—3 to 12 inches; light brownish gray (10YR 6/2) and pale brown (10YR 6/3) loamy fine sand, dark grayish brown (10YR 4/2) and dark brown (10YR 4/3) moist; single grained; loose; strong effervescence; moderately alkaline; abrupt smooth boundary.

C1—12 to 30 inches; pale brown (10YR 6/3), light gray (10YR 7/2), and very pale brown (10YR 7/3) medium sand; dark grayish brown (10YR 4/2), dark brown (10YR 4/3), and yellowish brown (10YR 5/6) moist; single grained; loose; slight effervescence; moderately alkaline; abrupt smooth boundary.

C2—30 to 45 inches; light brownish gray (10YR 6/2) loamy very fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

C3—45 to 60 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; massive; laminations evident; slightly hard, very friable; strong effervescence; moderately alkaline.

Free carbonates are generally throughout the profile, but in places the upper few inches is leached. The upper part of the A horizon is grayish brown to light gray and commonly is silty clay loam. In places it is loam, fine sandy loam, or loamy fine sand. The C horizon to a depth of 40 inches is loamy fine sand but it commonly is stratified with finer and coarser material.

Bankard soils are near Haverson and Munjor soils and are similar to Inavale soils. They are more sandy than Haverson and Munjor soils and are more calcareous than Inavale soils.

Ba—Bankard complex (0 to 2 percent slopes). This complex is on bottom lands along the White River. Areas are irregular in shape and are 15 to 100 acres in size. The nearly level slopes commonly are broken by very gentle undulations and narrow swales. Bankard soils make up about 65 percent of the mapped areas, Haverson and Munjor soils each make up about 15 percent, and the rest is included other soils. Bankard soils commonly are on very slight rises or undulations. Texture of the surface layer differs within a short distance. It is silty clay loam, loam, fine sandy loam, and loamy fine sand. Haverson and Munjor soils commonly are closely intermingled with Bankard soils and generally are in swales or on small flats.

Included with these soils in mapping are small areas of Promise soils along drainageways that head in the river breaks and flow through this complex to the river. Small areas of recent riverwash are adjacent to the river channel in some areas.

Runoff is slow. Most areas are subject to flooding, but flood damage generally is minor. The Bankard soil is droughty and is subject to soil blowing if it is farmed. Controlling soil blowing is the main concern in management.

All areas of this complex are in native vegetation. Native trees and shrubs in some areas provide excellent cover for wildlife and winter protection for livestock. Capability unit VIe–8; Sands range site.

Boro series

The Boro series consists of deep, moderately sloping, well drained soils on uplands. These soils formed in clayey materials. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is grayish brown silty clay about 3 inches thick. The subsoil, about 25 inches thick, is grayish brown silty clay in the upper part and olive clay in the lower part. It has spots and streaks of soft lime. The underlying material to a depth of 37 inches is olive clay. Pale olive silty clay is at a depth of 37 inches. The entire profile is calcareous.

Boro soils are medium in fertility and moderately low in content of organic matter. Permeability is slow, and the available water capacity is low or moderate.

About half of the acreage is in cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Boro silty clay in an area of Boro-Millboro silty clays, 5 to 9 percent slopes, in cultivation, 100 feet east and 1,120 feet north of the southwest corner of sec. 29, T. 100 N., R. 76 W.:

Ap—0 to 3 inches; dark grayish brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; cloddy and moderate medium granular structure; slightly hard, firm, sticky and plastic; slight effervescence; mildly alkaline; abrupt smooth boundary.

B21—3 to 12 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse subangular blocky structure parting to moderate medium blocky and subangular blocky; very hard, firm, very sticky and very plastic; common medium tongues of dark grayish brown (2.5Y 4/2); few fine segregations of lime; strong effervescence; moderately alkaline; clear wavy boundary.

B22ca—12 to 20 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium blocky structure parting to moderate fine blocky; very hard, firm, very sticky

and very plastic; few fine tongues of dark grayish brown (2.5Y 4/2); common fine segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

B3ca—20 to 28 inches; olive (5Y 5/3) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse blocky structure; very hard, firm, very sticky and very plastic; few fine tongues of dark grayish brown (2.5Y 4/2); common fine segregations of lime; strong effervescence; moderately alkaline; clear smooth boundary.

C1—28 to 37 inches; olive (5Y 5/3) clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, very sticky and very plastic; few fine tongues of dark grayish brown (2.5Y 4/2); strong effervescence; moderately alkaline; clear wavy boundary.

C2cs—37 to 50 inches; pale olive (5Y 6/3) silty clay, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; common fine nests of gypsum and salt crystals; strong effervescence; moderately alkaline; clear wavy boundary.

C3—50 to 60 inches; pale olive (5Y 6/3) silty clay, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; few fine nests of gypsum and salt crystals; strong effervescence; moderately alkaline.

When the soil is dry, cracks ½ to 2 inches wide and several feet long extend into the C horizon. The A horizon is dark grayish brown or grayish brown in hue of 2.5Y or 10YR and is 2 to 5 inches thick. The B2 horizon is grayish brown to pale olive in hue of 2.5Y or 5Y. It is 12 to 22 inches thick and in places the lower part is clay. The B3 horizon is clay or silty clay and is 4 to 10 inches thick. The C horizon is grayish brown to pale yellow in hue of 2.5Y or 5Y. In places brittle shale is at a depth of 40 to 60 inches.

Boro soils are mapped with Millboro soils and are near Carter, Lakoma, Okaton, and Witten soils. They have a thinner A horizon than Carter, Millboro, and Witten soils. Boro soils are deeper over shale than Lakoma and Okaton soils.

BmC—Boro-Millboro silty clays, 5 to 9 percent slopes. Areas of this complex are irregular in shape and are 100 to 250 acres in size. This complex is about 45 percent Boro soil, 30 percent Millboro soil, and 25 percent other soils. Slopes are long and smooth. The Boro soil is on the tops and upper sides of convex ridges, and the Millboro soil is on the lower side slopes (fig. 8). This

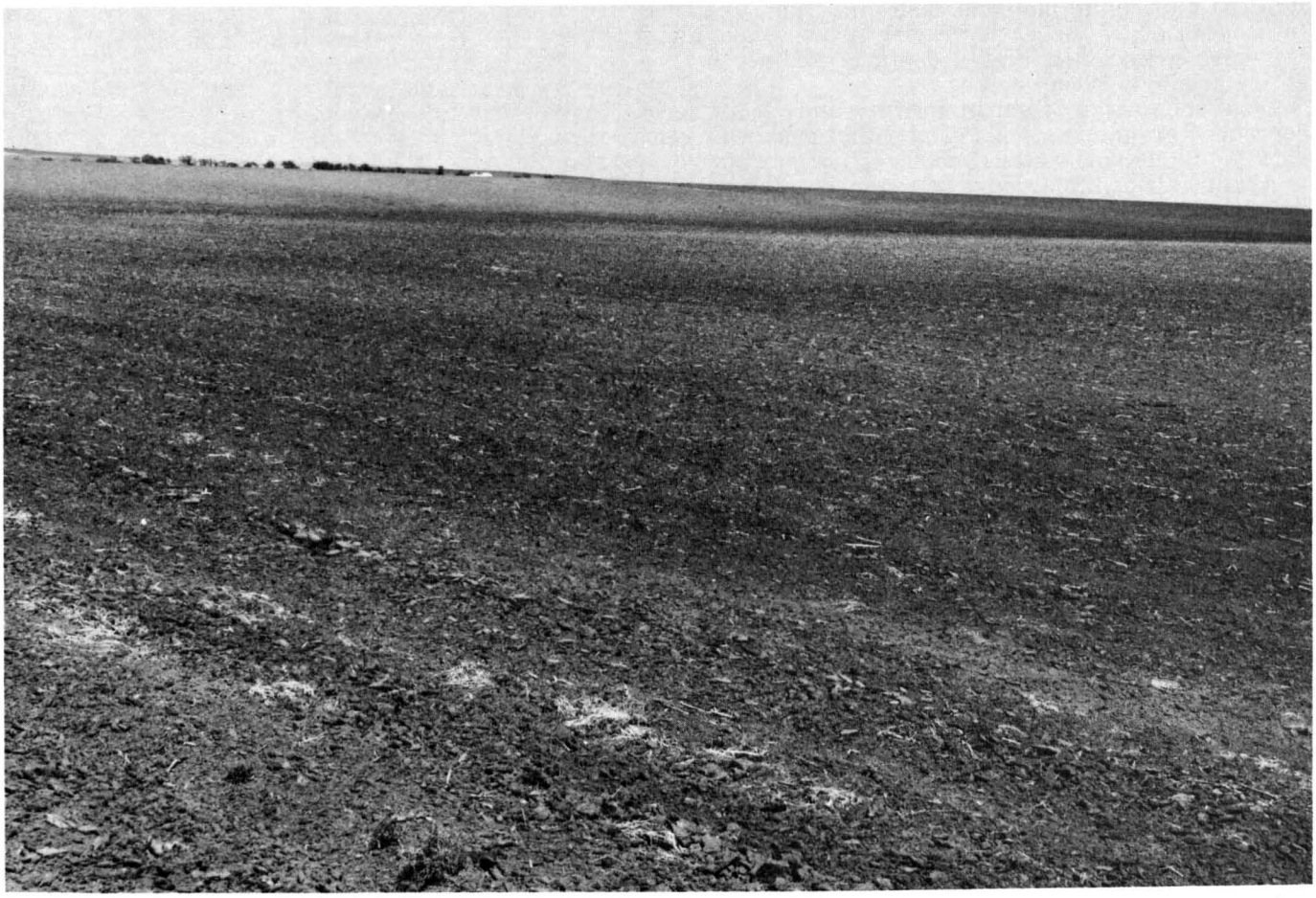

Figure 8.—**An area of Boro-Millboro silty clays, 5 to 9 percent slopes. The lighter shaded areas are Boro soils.**

Millboro soil has a thinner surface layer than the soil described as representative of the series.

Included with these soils in mapping are Lakoma and Witten soils. Lakoma soils are the most extensive and are on some of the ridges and points and along incised drainageways. Witten soils are in swales.

Runoff is medium. These soils lose their tilth if cultivated when wet, and they are subject to water erosion and soil blowing. Controlling water erosion and soil blowing and maintaining good tilth are the main concerns in management.

Most areas of this complex are in cultivated crops, mainly sorghum and winter wheat. Areas in native grass are used for grazing and hay. Capability unit IVe–4; Clayey range site.

Boyd series

The Boyd series consists of moderately deep, moderately sloping to moderately steep, well drained, clayey soils on uplands. These soils formed in material weathered from underlying shale. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is dark grayish brown clay about 5 inches thick. The subsoil is grayish brown clay about 14 inches thick. Spots and streaks of soft lime are in the lower part and extend into the underlying material. The underlying material to a depth of 27 inches is grayish brown clay. Light brownish gray shale is at a depth of 27 inches. The entire profile is calcareous.

Boyd soils are medium in fertility and moderate in content of organic matter. Permeability is slow or very slow, and available water capacity is low or very low.

About half of the acreage of the moderately sloping soils are farmed. Many areas remain in native grass and are used for grazing and hay.

Representative profile of Boyd clay in an area of Boyd-Okaton association, 9 to 25 percent slopes, in native grass, 2,515 feet east and 1,300 feet south of the northwest corner of sec. 27, T. 95 N., R. 75 W.:

A1—0 to 5 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, firm, sticky and plastic; slight effervescence; mildly alkaline; clear smooth boundary.

B21—5 to 9 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; weak medium and fine prismatic structure parting to moderate medium and fine subangular blocky; hard, firm, sticky and plastic; slight effervescence; moderately alkaline; clear wavy boundary.

B22—9 to 19 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate coarse blocky parting to weak medium and fine blocky; hard, very firm, very sticky and very plastic; few medium segregations of lime in lower part; strong effervescence; gradual wavy boundary.

C1ca—19 to 23 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse and medium blocky structure; very hard, firm, very sticky and very plastic; 10 to 20 percent fragments of soft shale; many medium segregations of lime; violent effervescence; moderately alkaline; gradual wavy boundary.

C2ca—23 to 27 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, very sticky and very plastic; few stains of light olive brown; 60 percent fragments of soft shale; many medium segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

Cr1—27 to 38 inches; light brownish gray (2.5Y 6/2) shale, olive brown (2.5Y 4/4) moist; platy bedrock structure; few stains of light olive brown; few medium segregations of lime and gypsum; strong effervescence; moderately alkaline; clear smooth boundary.

Cr2—38 to 60 inches; light brownish gray (2.5Y 6/2) shale, grayish brown (2.5Y 5/2) moist; platy bedrock structure; brittle; few light olive brown stains; few nests of gypsum crystals; strong effervescence; moderately alkaline.

Shale is at a depth of 25 to 40 inches. When the soil is dry, cracks as much as 1 inch wide and several feet long extend to the shale. Free carbonates are generally throughout the soil, but in places the A horizon is noncalcareous. The A horizon is dark grayish brown or grayish brown in hue of 10YR or 2.5Y, and in places it is silty clay. It is 5 to 7 inches thick. The B2 horizon is dark grayish brown or grayish brown and is 14 to 25 inches thick. The C horizon is grayish brown to pale olive in hue of 2.5Y or 5Y. The C horizon above the shale has few to many segregations of lime and in places has segregations of gypsum.

Boyd soils are mapped with Okaton soils; are near Lakoma, Millboro, Reliance, and Witten soils; and are similar to Opal soils. Boyd soils are deeper over shale than Okaton soils and have a darker color in the upper part of the B horizon when moist than Lakoma soils. They are shallower over shale than Millboro and Witten soils. Boyd soils contain less clay than Opal soils and are more clayey than Reliance soils.

BnC—Boyd clay, 5 to 9 percent slopes. This soil is on uplands. Areas are irregular in shape and are 50 to 300 acres in size. Slopes are convex.

Included with this soil in mapping are small areas of Lakoma, Manter, Millboro, Ree, and Witten soils. Lakoma soils are on convex ridges. Manter and Ree soils are in the higher part of the landscape in some of the mapped areas in the southeastern part of the county. Millboro soils are in the lower part of the landscape where the slopes are plane. Witten soils are in swales. Small gravelly spots are in some areas and are shown on the soil map by a spot symbol.

Runoff is medium. This soil is subject to water erosion and soil blowing. It also loses tilth if farmed when wet. Controlling water erosion and soil blowing

and maintaining good tilth are the main concerns in management.

About half the acreage is in cultivated crops, mainly alfalfa, corn, sorghum, and winter wheat. Areas in native grass are used for grazing and hay. Capability unit IVe–4; Clayey range site.

BOD—Boyd-Okaton association, 9 to 25 percent slopes. Areas of this association are irregular in shape and are 150 to 400 acres in size. They contain numerous well drained drainageways. This mapping unit is about 50 to 70 percent Boyd soil, 20 to 30 percent Okaton soil, and 10 to 20 percent other soils. These soils are mostly strongly sloping to moderately steep, so mapping them separately was not feasible. The Boyd soil is in the mid and lower parts of the landscape, and the Okaton soil is on the tops and upper sides of convex ridges. The Boyd soil in this mapping unit has the profile described as representative of the Boyd series. The depth to lime in the Okaton soil is greater than in the soil described as representative of the Okaton series.

Included with these soils in mapping are small areas of Manter and Ree soils on some of the ridges. A gray siltstone and claystone caprock is exposed on the upper sides of deeply entrenched drainageways in some areas in T. 96 N., R. 77 W. Small gravelly areas are on some of the higher ridges and are shown on the soil map by a spot symbol.

Runoff is rapid. The hazard of erosion is very severe if an adequate cover of plants is not maintained. Controlling water erosion is the main concern in management.

Most areas of these soils are in native grass and are used for grazing. Clumps and stringers of native trees and shrubs in some of the draws provide food and cover for wildlife. Capability unit VIe–4; Boyd part in Clayey range site, Okaton part in Shallow range site.

Bridgeport series

The Bridgeport series consists of deep, nearly level, well drained, silty soils on low terraces and bottom lands. These soils formed in alluvium. The native vegetation is mainly tall and mid grasses. Native trees are along stream channels.

In a representative profile the surface layer is silty clay loam about 11 inches thick; the upper part is dark grayish brown, and the lower part is grayish brown. The subsoil, about 15 inches thick, is grayish brown and pale brown silty clay loam. The underlying material to a depth of 46 inches is grayish brown heavy silty clay loam that has spots and streaks of lime and salts. Light yellowish brown silty clay loam is at a depth of 46 inches. The entire profile is calcareous.

Bridgeport soils are high in fertility and moderate in content of organic matter. Permeability is moderate, and available water capacity is high. Some areas are subject to flooding.

Most areas are in cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Bridgeport silty clay loam in an area of Bridgeport complex, in crops, 192 feet south and 1,600 feet east of the northwest corner of sec. 30, T. 99 N., R. 76 W.:

Ap1—0 to 5 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; hard, very friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

Ap2—5 to 8 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium blocky structure parting to strong medium granular; hard, very friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

A12—8 to 11 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; few pale brown (10YR 6/3) granules; moderate medium blocky structure parting to strong medium granular; hard, firm; slight effervescence; mildly alkaline; clear smooth boundary.

B2—11 to 26 inches; grayish brown (10YR 5/2) and pale brown (10YR 6/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure parting to moderate fine subangular blocky; very hard, firm; slight effervescence; mildly alkaline; clear wavy boundary.

C1—26 to 31 inches; grayish brown (10YR 5/2) heavy silty clay loam, dark grayish brown (10YR 4/2) moist; massive; very hard, very firm; few medium nests of salt and segregations of lime; strong effervescence; moderately alkaline; clear wavy boundary.

C2casa—31 to 46 inches; grayish brown (2.5Y 5/2) heavy silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm; many medium nests of salt and segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C3sa—46 to 60 inches; light yellowish brown (2.5Y 6/3) silty clay loam, olive brown (2.5Y 5/3) moist; massive; very hard, firm; many nests of salt crystals; strong effervescence; moderately alkaline.

Free carbonates are at a depth of 10 inches or less. The A horizon ranges from dark gray to grayish brown. It commonly is silty clay loam, but in places it is silt loam or fine sandy loam. It is 10 to 18 inches thick. The B horizon is 8 to 15 inches thick. In places the C horizon is stratified with thin layers of silt loam, loam, or fine sandy loam.

Bridgeport soils in Tripp County are more clayey above a depth of 40 inches and contain more salts in the C horizon than is defined in the range for the series, but these differences do not alter their usefulness or behavior.

Bridgeport soils are near Carter, Vetal, and Witten soils. They are less clayey in the B horizon than Carter and Witten soils and are more clayey than Vetal soils.

Bp—Bridgeport complex (0 to 2 percent slopes). This complex is in narrow stream valleys. Areas are 20

to 200 acres or more in size. Bridgeport soils typically make up about 65 percent of the mapped areas, and Carter, Erd, and Witten soils make up about 30 percent. Bridgeport soils commonly have a surface layer of silty clay loam or silt loam, but in places the surface layer is fine sandy loam. A Bridgeport soil in an area of this complex has the profile described as representative of the series. The Carter, Erd, and Witten soils are on flats and in swales. They have a surface layer of silty clay loam, clay, and silty clay.

Included with these soils in mapping are small areas of Anselmo, Mosher, and Vetal soils on foot slopes and fans on the edges of some areas. Small gumbo or scabby spots are in some areas and are shown on the soil map by a spot symbol.

Runoff is slow. Bridgeport soils usually receive extra moisture in the form of runoff from adjacent uplands and are subject to stream flooding in some years. The additional moisture is beneficial in most years, but in dry years conserving moisture is a concern in management.

Most areas of this complex are farmed. Alfalfa, corn, oats, sorghum, and winter wheat are the main crops. Capability unit IIc–1; Overflow range site.

Bt—Bridgeport complex, channeled (0 to 2 percent slopes). This complex is in stream valleys. Areas are 20 to 80 acres in size. The mapped areas are dissected by meandering channels that are 15 to 20 feet wide and 5 to 15 feet deep. Bridgeport soils typically make up about 65 percent of the mapped areas, and Carter, Cass, Erd, and Inavale soils make up about 30 percent. Bridgeport soils commonly have a surface layer of silty clay loam or silt loam, but in places the surface layer is fine sandy loam. Carter and Erd soils are closely intermingled with the Bridgeport soils; they have a surface layer of silty clay loam and clay. Cass and Inavale soils are adjacent to the channels in places; they have a surface layer of loamy fine sand, fine sandy loam, or very fine sandy loam.

Included with these soils in mapping are small areas of Anselmo and Vetal soils on foot slopes and fans on the edges of the valleys and small areas of Witten soils in swales.

Runoff is slow. Flooding is a hazard during periods of snowmelt in spring and after heavy rains in summer, but the well defined channels remove most of the excess water.

Most areas of this complex are in native vegetation and are used for grazing and hay. The meandering channels dissect the mapped areas into small tracts that are not practical to farm but that are suited to gardens. Native trees and shrubs along the channels provide cover for wildlife and winter protection for livestock. Capability unit VIw–1; Overflow range site.

Canning series

The Canning series consists of gently sloping to strongly sloping, well drained, loamy soils that are moderately deep over gravelly sand. These soils are on high terraces and formed in alluvium. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is dark grayish brown loam about 5 inches thick. The subsoil is clay loam about 17 inches thick; it is dark grayish brown in the upper part, dark brown in the middle part, and grayish brown in the lower part. The underlying material to a depth of 25 inches is pale brown, calcareous gravelly loam. Light brownish gray, light gray, and very pale brown, calcareous gravelly sand is at a depth of 25 inches.

Canning soils are medium in fertility and moderate in content of organic matter. Permeability is moderate in the subsoil and rapid in the underlying gravelly sand. Available water capacity is low or moderate.

Most areas of these soils remain in native grass and are used for grazing. A few larger and more accessible areas are cropped.

Representative profile of Canning loam, 2 to 5 percent slopes, in native grass, 2,140 feet east of the southwest corner of sec. 10, T. 102 N., R. 78 W.:

A1—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to moderate fine granular; soft, very friable; neutral; clear smooth boundary.

B21t—5 to 9 inches; dark grayish brown (10YR 4/2) light clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; mildly alkaline; clear smooth boundary.

B22t—9 to 15 inches; dark brown (10YR 4/3) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and slightly plastic; mildly alkaline; clear smooth boundary.

B3—15 to 22 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak coarse blocky structure; slightly hard, friable, slightly sticky and slightly plastic; mildly alkaline; abrupt wavy boundary.

C1ca—22 to 25 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; moderately alkaline; strong effervescence; clear wavy boundary.

IIC2—25 to 38 inches; light brownish gray (10YR 6/2) gravelly sand, grayish brown (10YR 5/2) moist; single grained; loose; mildly alkaline; diffuse wavy boundary.

IIC3—38 to 60 inches; light gray (10YR 7/2) and very pale brown (10YR 7/3) gravelly sand, grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) moist; single grained; loose; mildly alkaline.

Gravelly sand is at a depth of 20 to 40 inches. The A horizon is dark grayish brown or grayish brown loam or silt loam and is 4 to 7 inches thick. The B2t horizon is dominantly clay loam, but in places the upper part is silty clay loam. It is 9 to 18 inches thick. In places the Cca horizon is loam.

Canning soils are mapped with or near Keya, Murdo, Ree, and Schamber soils and are similar to Chappell soils. They contain more clay and less sand in the B horizon than Chappell soils. Canning soils have gravelly sand in the C horizon above a depth of 40 inches, whereas Keya and Ree soils do not. They are deeper over gravelly sand than Murdo and Schamber soils.

CaB—Canning loam, 2 to 5 percent slopes. This soil is on high terraces. Areas are 20 to 100 acres in size. The soils are mostly gently sloping. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Keya, Murdo, and Ree soils. Keya soils are in swales. Murdo soils are on low ridges. Ree soils are intermingled with Canning soils. Also included are small areas of Canning loam that has slopes of less than 2 percent.

Runoff is medium. The hazard of erosion is moderate. This soil is somewhat droughty because of the underlying gravelly sand. Controlling water erosion and conserving moisture are the main concerns in management.

Most areas of this soil are in native grass and are used for grazing. Capability unit IIIe–6; Silty range site.

CbD—Canning-Murdo loams, 6 to 15 percent slopes. This complex is on high terraces. Areas are irregular in shape and are 50 to more than 200 acres in size. This complex is about 50 percent Canning soil, 30 percent Murdo soil, and 20 percent other soils. The Canning soil is on the mid and lower parts of the landscape, and the Murdo soil is on the tops and upper sides of ridges. The Canning soil has a thinner subsoil than the soil described as representative of the Canning series.

Included with these soils in mapping are Keya, Ree, and Schamber soils. Keya soils are in swales. Ree soils are on foot slopes or flattened ridgetops. Schamber soils are on the shoulders of draws and on some of the ridges. Some areas contain small gravel pits which are shown on the soil map by a spot symbol.

Runoff is medium. The hazard of water erosion is severe if an adequate plant cover is not maintained. These soils are droughty. Controlling water erosion and conserving moisture are the main concerns in management.

Most areas of this complex are in native grass and are used for grazing. Capability unit VIe–5; Canning part in Silty range site, Murdo part in Shallow to Gravel range site.

Canyon series

The Canyon series consists of shallow, moderately sloping to strongly sloping, well drained, loamy soils on uplands. These soils formed in loamy material weathered from underlying sandstone. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is grayish brown loam about 3 inches thick. Below this is a transitional layer of light brownish gray and light gray, calcareous loam about 3 inches thick. The underlying material to a depth of 10 inches is light brownish gray, calcareous loam that contains many fragments of sandstone. White, calcareous sandstone is at a depth of 10 inches.

Canyon soils are low in fertility and in content of organic matter. Permeability is moderate above the sandstone, and available water capacity is very low.

Most areas of these soils remain in native grass and are used for grazing. Some areas where the Canyon soil is closely intermingled with arable soils are farmed.

Canyon soils in Tripp County are mapped only in complex with Rosebud soils.

Representative profile of Canyon loam in an area of Rosebud-Canyon loams, 9 to 15 percent slopes, in native grass, 240 feet north and 1,030 feet east of the southwest corner of sec. 13, T. 97 N., R. 78 W.:

A1—0 to 3 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine granular structure; slightly hard, very friable; neutral; abrupt wavy boundary.

AC—3 to 6 inches; light brownish gray (10YR 6/2) and light gray (10YR 7/2) loam, dark grayish brown (10YR 4/2) moist; very weak fine subangular blocky structure parting to weak fine and medium granular; slightly hard, very friable; common fine sandstone fragments; slight effervescence; mildly alkaline; clear wavy boundary.

C—6 to 10 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; massive; bedding planes evident; slightly hard, very friable; 25 percent sandstone fragments; slight effervescence; mildly alkaline; clear wavy boundary.

Cr1—10 to 52 inches; white (5Y 8/2) soft sandstone, olive (5Y 5/3) moist; coarse bedding planes; cemented, brittle when dry; slight effervescence; mildly alkaline; gradual wavy boundary.

Cr2—52 to 60 inches; white (5Y 8/2) fine grained sandstone, olive (5Y 5/3) moist; platy bedrock structure; cemented, brittle when dry; slight effervescence; mildly alkaline.

Sandstone is at a depth of 8 to 20 inches. Free carbonates are at the surface in places. The A horizon is dark grayish brown to light brownish gray. It commonly is loam, but in places it is silt loam or fine sandy loam. It is 3 to 6 inches thick. In places the AC horizon is grayish brown. It is loam or very fine sandy loam and is 3 to 6 inches thick. The C horizon above the sandstone is grayish brown or light brownish gray loam or very fine sandy loam and contains 25 to 50 percent sandstone fragments. The sandstone is white or light gray in hue of 10YR, 2.5Y, or 5Y and is weakly cemented to moderately cemented.

Canyon soils are mapped with or near Manter, Rosebud, and Tassel soils and are similar to Epping soils. They are less silty and contain more sand than Epping soils. Canyon soils are shallower to sandstone than Manter and Rosebud soils. They contain more clay and less sand than Tassel soils.

Carter series

The Carter series consists of deep, nearly level, moderately well drained, silty soils that have a claypan subsoil. These soils are on terraces, foot slopes, and in swales. They formed in clayey materials. The native vegetation is short and mid grasses.

In a representative profile the surface layer is dark gray and gray silty clay loam about 8 inches thick. The subsoil is clay about 14 inches thick. It is dark grayish brown in the upper part and grayish brown and calcareous in the lower part. The underlying material to a depth of 34 inches is grayish brown, calcareous clay. Light brownish gray, calcareous silty clay is at a depth of 34 inches. Nests of salt crystals are in the underlying material.

Carter soils are medium in fertility and moderate in content of organic matter. Permeability is very slow, and available water capacity is low or moderate.

About half of the acreage is in cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Carter silty clay loam, in native grass, 1,230 feet west and 585 feet south of the northeast corner of sec. 17, T. 100 N., R. 79 W.:

A11—0 to 6 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium and fine subangular blocky structure parting to weak thin platy; slightly hard, very friable, slightly sticky; neutral; abrupt smooth boundary.

A12—6 to 8 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; weak thin and medium platy structure parting to moderate medium granular; slightly hard, very friable, slightly sticky; neutral; abrupt smooth boundary.

B21t—8 to 11 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium columnar structure; extremely hard, extremely firm, very sticky and very plastic; mildly alkaline; abrupt wavy boundary.

B22t—11 to 13 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium blocky; extremely hard, extremely firm, very sticky and very plastic, slight effervescence; moderately alkaline; clear wavy boundary.

B3—13 to 22 inches; grayish brown (10YR 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium blocky structure; extremely hard, extremely firm, very sticky and very plastic; slight effervescence; moderately alkaline; clear wavy boundary.

C1ca—22 to 34 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, extremely firm, very sticky and very plastic; few fine segregations of lime; strong effervescence; moderately alkaline; clear wavy boundary.

C2sa—34 to 60 inches; light brownish gray (2.5Y 6/3) silty clay, grayish brown (2.5Y 5/3) moist; massive; very hard, firm, sticky and plastic; common fine nests of salt crystals; strong effervescence; mildly alkaline.

Free carbonates are at a depth of 10 to 23 inches. Reaction is neutral or mildly alkaline in the A and B21t horizons and mildly alkaline or moderately alkaline in the rest of the profile. Exchangeable sodium in the B2t and C horizons is less than 15 percent. In places few to common tongues of A horizon material extend downward. The A horizon is dark gray to grayish brown, but in places the lower part is gray or light brownish gray. It is silt loam or silty clay loam and is 6 to 10 inches thick. The B2t horizon is dark grayish brown or grayish brown in hue of 10YR or 2.5Y and is 4 to 12 inches thick. The B3 horizon is grayish brown to light yellowish brown in hue of 10YR or 2.5Y, and in places it is silty clay. The C horizon is grayish brown to pale olive in hue of 2.5Y or 5Y and has few to many segregations of lime and salt crystals.

Carter soils are near Erd, Hurley, Millboro, Promise, and Witten soils. Carter soils have columnar structure in the B horizon, whereas Erd, Millboro, Promise, and Witten soils do not. They have a thicker A horizon and contain less sodium than Hurley soils.

Cc—Carter silty clay loam (0 to 2 percent slopes). Areas of this soil are long and narrow and irregular in shape. They are 50 to 200 acres in size. Slopes are long and are plane to slightly concave. In places the surface layer is uneven because small mounds rise several inches above the intervening low spots.

Included with this soil in mapping are small areas of Hurley, Millboro, Promise, and Witten soils. Hurley soils are in low spots where the surface layer is uneven. Millboro and Promise soils are on mounds or slight rises. Witten soils are in swales. Wet spots are in some mapped areas and are shown on the soil map by a spot symbol.

Runoff is slow. This soil receives extra moisture in the form of runoff from adjacent soils. The additional moisture is beneficial in most years. This soil is difficult to work and the clayey subsoil takes in water slowly. Maintaining good tilth and improving water intake are the main concerns in management.

About half of the acreage is in cultivated crops, mainly alfalfa, sorghum, and winter wheat. Areas in native grass are used for grazing and hay. Capability unit IVs–2; Claypan range site.

Cass series

The Cass series consists of deep, nearly level, well drained, loamy soils on bottom lands. These soils formed in alluvium. The native vegetation is mainly mid and tall grasses. Native trees were along channels in some areas.

In a representative profile the surface layer is about 17 inches thick; it is dark grayish brown fine sandy loam in the upper part and dark grayish brown very fine sandy loam in the lower part. The underlying material to a depth of 40 inches is mostly light brown-

ish gray and grayish brown, calcareous loamy fine sand. It includes a 4-inch-thick layer of grayish brown silt loam at a depth of 19 inches. Light gray, calcareous fine sand is at a depth of 40 inches.

Cass soils are medium in fertility and moderate in content of organic matter. Permeability is moderately rapid, and available water capacity is moderate. Some areas are subject to flooding.

Most areas of these soils remain in native grass and are used for grazing. Some areas are in cultivated crops.

Representative profile of Cass fine sandy loam, in native grass, 60 feet west and 1,340 feet south of the northeast corner of sec. 31, T. 96 N., R. 77 W.:

A11—0 to 6 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark gray (10YR 3/1) moist; weak fine and medium granular structure; soft, very friable; neutral; clear smooth boundary.

A12—6 to 17 inches; dark grayish brown (10YR 4/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse subangular blocky structure; soft, very friable; neutral; clear wavy boundary.

C1—17 to 19 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure; soft, loose; slight effervescence; mildly alkaline; abrupt smooth boundary.

C2—19 to 23 inches; grayish brown (10YR 5/2) silt loam, dark gray (10YR 4/1) moist; moderate fine blocky structure; slightly hard, very friable; slight effervescence; mildly alkaline; clear smooth boundary.

C3—23 to 27 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; soft, loose; slight effervescence; moderately alkaline; clear smooth boundary.

C4—27 to 40 inches; light brownish gray (10YR 6/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; loose; slight effervescence; moderately alkaline; clear smooth boundary.

C5—40 to 60 inches; light gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) moist; single grained; loose; slight effervescence; moderately alkaline.

The A horizon is dark grayish brown or grayish brown. It commonly is fine sandy loam or very fine sandy loam, but in places it is loam. It is 11 to 18 inches thick. The C horizon is loamy fine sand or fine sandy loam and commonly is stratified with layers of finer and coarser material. Some pedons have a buried A horizon within the C horizon.

Cass soils are mapped near Doger, Inavale, Wann, and Whitelake soils. They are less sandy than Doger and Inavale soils. Cass soils are better drained than Wann soils. They do not have columnar structure in the B horizon, as Whitelake soils do, and they contain less sodium than Whitelake soils.

Cd—Cass fine sandy loam (0 to 2 percent slopes). This soil is on bottom lands along the Keya Paha River. Areas are 20 to 150 acres in size and most are long and narrow and in places contain meander scars.

Included with this soil in mapping are small areas of Inavale, Lute, and Whitelake soils. Inavale soils are near the river channel. Lute soils are in low spots, some of which are shown on the soil map by the spot symbol for gumbo or scabby spots. Whitelake soils also are in low areas.

Runoff is slow, and most of the rainfall enters the soil. This soil is easy to work, but it is subject to soil blowing. Controlling soil blowing is the main concern in management.

Most areas of this soil are in native grass and are used for grazing and hay. Alfalfa, oats, and corn are the main crops in cultivated areas. Capability unit IIIe–7; Sandy range site.

Chappell series

The Chappell series consists of nearly level to moderately sloping, well drained, loamy soils that are moderately deep over gravelly sand (fig. 9). These soils are on terraces. They formed in sandy material over-

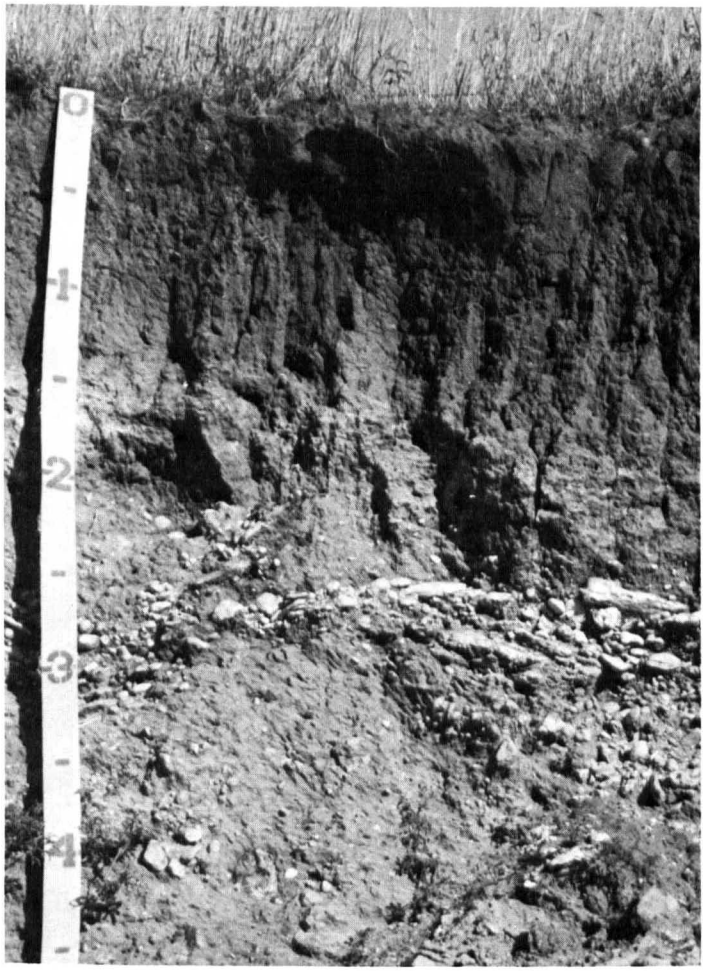

Figure 9.—**Gravelly sand is at a depth of about 30 inches in this profile of Chappell fine sandy loam, 0 to 3 percent slopes.**

lying gravelly alluvium. The native vegetation is mainly mid and tall grasses.

In a representative profile the surface layer is dark grayish brown fine sandy loam about 7 inches thick. The subsoil is fine sandy loam about 13 inches thick; the upper part is very dark grayish brown, the middle part is dark grayish brown, and the lower part is grayish brown. The underlying material to a depth of 26 inches is pale brown gravelly sandy loam. Light gray and white, calcareous gravelly sand is at a depth of 26 inches.

Chappell soils are medium in fertility and moderate in content of organic matter. Permeability is moderately rapid in the subsoil and is rapid in the underlying gravelly sand. Available water capacity is low.

About half of the acreage is cropped. Areas in native grass are used for grazing and hay.

Representative profile of Chappell fine sandy loam, 0 to 3 percent slopes, in cultivation, 190 feet east and 2,240 feet north of the southwest corner of sec. 32, T. 96 N., R. 77 W.:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable; neutral; abrupt smooth boundary.

B21—7 to 11 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

B22—11 to 15 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; neutral; clear smooth boundary.

B3—15 to 20 inches; grayish brown (10YR 5/2) heavy fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; hard, friable; neutral; clear smooth boundary.

C1—20 to 26 inches; pale brown (10YR 6/3) gravelly sandy loam, brown (10YR 5/3) moist; single grained; loose; neutral; abrupt wavy boundary.

IIC2—26 to 60 inches; light gray (10YR 7/2) and white (10YR 8/1) gravelly sand, grayish brown (10YR 5/2), pale brown (10YR 6/3), and light gray (10YR 7/2) moist; single grained; loose; violent effervescence; moderately alkaline.

Gravelly sand is at a depth of 20 to 34 inches. Reaction is neutral or slightly acid in the solum. The A horizon is dark grayish brown or very dark grayish brown. It commonly is fine sandy loam, but in places the upper part is loamy fine sand. It is 5 to 9 inches thick. The B horizon commonly is fine sandy loam, but the B3 horizon is loamy fine sand to sandy clay loam. In places the C1 horizon is fine sandy loam or loamy fine sand. The lower part of the C horizon is gravelly loamy sand or gravelly sand that ranges widely in the amount of gravel.

Chappell soils in Tripp County contain more fragments of calcareous sandstone and siltstone in the C horizon than is defined in the range for the series, but this difference does not alter their usefulness or behavior.

Chappell soils are mapped with or near Anselmo, Dix, Doger, Dunday, and Vetal soils and are similar to Canning soils. They have more gravel in the C horizon than Anselmo, Doger, Dunday, and Vetal soils and less sand in the A and B horizons than Doger and Dunday soils. Chappell soils contain less clay and more sand in the B horizon than Canning soils, and they are deeper over gravelly sand than Dix soils.

ChA—Chappell fine sandy loam, 0 to 3 percent slopes. This soil is on terraces. Areas are irregular in shape and are 50 to more than 200 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Anselmo, Dix, Vetal, and Whitelake soils. Anselmo and Vetal soils are the most extensive. Anselmo soils are intermingled with Chappell soils. Dix soils are on the crests of very slight rises and low humps. Vetal and Whitelake soils are in swales and low flat areas. Gumbo or scabby spots are in some mapped areas and are shown on the soil map by a spot symbol. Some areas contain small gravel pits, which are shown on the soil map by a spot symbol.

Runoff is slow, and most of the rainfall enters the soil. This soil is easy to work, but it is subject to soil blowing and is somewhat droughty. Controlling soil blowing and conserving moisture are the main concerns in management.

About half of the acreage is in cultivated crops, mainly alfalfa, corn, and oats. Areas in native grass are used for grazing and hay. Capability unit IIIe–9; Sandy range site.

CnC—Chappell-Dix fine sandy loams, 6 to 9 percent slopes. This complex is on remnants of high terraces and on terrace fronts. Areas are long and narrow. They are 50 to 150 acres in size. The complex is about 55 percent Chappell soil, 25 percent Dix soil, and 20 percent other soils. The Chappell soil is on the mid and lower parts of the landscape. The Dix soil is on ridges and on the sharp shoulders of drainageways. The Chappell soil has a thinner surface layer and is slightly shallower to gravelly sand than the soil described as representative of the Chappell series. The Dix soil is deeper to gravelly sand than the soil described as representative of the Dix series.

Included with these soils in mapping are Anselmo, Vetal, and Whitelake soils. Anselmo soils are the most extensive and are on the lower part of the landscape. Vetal soils are in swales. Whitelake soils are on some of the foot slopes.

Runoff is medium. These soils are subject to soil blowing and water erosion. They also are too droughty for farming. Controlling soil blowing and water erosion and conserving moisture are the main concerns in management.

Most areas of this complex are in native grass and are used for grazing. Alfalfa, corn, and oats are the main crops in cultivated areas. Capability unit VIe–5; Chappell part in Sandy range site, Dix part in Shallow to Gravel range site.

Dix series

The Dix series consists of nearly level to moderately steep, somewhat excessively drained and excessively drained, loamy soils that are shallow over gravelly sand. These soils are on terraces, terrace remnants, and terrace escarpments. They formed in gravelly alluvium. The native vegetation is mainly short and mid grasses.

In a representative profile the surface layer is dark grayish brown fine sandy loam about 4 inches thick. Below this is a transitional layer of dark grayish brown fine sandy loam about 5 inches thick. The underlying material to a depth of 12 inches is dark grayish brown and grayish brown, calcareous gravelly sandy loam. Pale brown, light gray, very pale brown, and white, calcareous gravelly sand is at a depth of 12 inches.

Dix soils are low in fertility and moderately low in content of organic matter. Permeability is rapid, and available water capacity is very low or low.

Nearly all areas of these soils remain in native grass and are used for grazing.

Representative profile of Dix fine sandy loam in an area of Dix soils, 9 to 18 percent slopes, in native grass, 75 feet west and 1,700 feet south of the northeast corner of sec. 31, T. 96 N., R. 77 W.:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable; neutral; clear smooth boundary.

AC—4 to 9 inches; dark brown (10YR 4/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, friable; neutral; abrupt smooth boundary.

IIC1—9 to 12 inches; dark brown (10YR 4/3) and grayish brown (10YR 5/2) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; some white (10YR 8/2) pebbles; massive; soft, very friable; slight effervescence; mildly alkaline; clear wavy boundary.

IIC2—12 to 60 inches; pale brown (10YR 6/3), light gray (10YR 7/2), very pale brown (10YR 7/3), and white (10YR 8/2) gravelly sand, grayish brown (10YR 5/2) moist; single grained; loose; violent effervescence; moderately alkaline.

Gravelly sand is at a depth of 10 to 20 inches. The A and AC horizons are neutral or mildly alkaline and in places are gravelly. The A horizon is dark grayish brown or grayish brown and is 3 to 5 inches thick. The AC horizon is dark grayish brown to brown and is 5 to 8 inches thick. The gravel in the C horizon is mostly fragments of calcareous sandstone and siltstone, but in places it is quartzitic.

Dix soils in Tripp County contain more fragments of calcareous sandstone and siltstone in the C horizon than is defined in the range for the series, but this difference does not alter their usefulness or behavior.

Dix soils are mapped with Chappell soils and are similar to Murdo and Schamber soils. They are shallower to gravelly sand than Chappell soils and contain more sand in the horizons above the gravelly sand than Murdo soils. Dix soils have dark colors when moist to a greater depth than Schamber soils.

DaA—Dix fine sandy loam, 0 to 3 percent slopes. This soil is on terraces along the Keya Paha River. Areas are irregular in shape and are 30 to 100 acres in size. This soil is slightly deeper to gravelly sand than the soil described as representative of the series.

Included with this soil in mapping are small areas of Chappell and Vetal soils. Chappell soils are generally near the edges of the mapped areas. Vetal soils are in swales. Gravel pits are in some areas and are shown on the soil map by a spot symbol.

Runoff is slow, and most of the rainfall enters the soil. This soil is very droughty and is subject to soil blowing if adequate plant cover is not maintained. Controlling soil blowing and conserving moisture are the main concerns in management.

All areas of this soil are in native grass and are used for grazing. Capability unit VIs–4; Shallow to Gravel range site.

DbD—Dix soils, 9 to 18 percent slopes. These soils are on remnants of high terraces and on terrace fronts parallel to the Keya Paha River. Areas are long and narrow. They are 50 to 200 acres in size. The surface layer in some areas is mostly fine sandy loam, and in other areas it is mostly gravelly sandy loam. A Dix soil in an area of this mapping unit has the profile described as representative of the series.

Included with these soils in mapping are small areas of Anselmo, Chappell, and Vetal soils. Of these, Chappell soils are the most extensive and are on smooth ridgetops or on the lower part of the landscape below Dix soils. Anselmo soils are on foot slopes, and Vetal soils are in swales. These included soils make 10 to 25 percent of mapped areas.

Runoff is medium. These soils are very droughty. They are subject to soil blowing and water erosion if the plant cover is removed. Conserving moisture and controlling soil blowing and water erosion are the main concerns in management.

All areas of these soils are in native grass and are used for grazing. Capability unit VIIs–4; Shallow to Gravel range site.

Doger series

The Doger series consists of deep, nearly level to undulating, well drained, sandy soils on uplands. These soils formed in wind-worked sandy material. The native vegetation is mainly mid and tall grasses.

In a representative profile the surface layer is dark grayish brown loamy fine sand about 11 inches thick. Below this is a layer of dark grayish brown loamy fine sand about 24 inches thick. The underlying material is grayish brown loamy fine sand.

Doger soils are medium in fertility and moderate in content of organic matter. Permeability is rapid, and available water capacity is low or moderate.

About half of the acreage is in cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Doger loamy fine sand, 0 to 6 percent slopes, in native grass, 150 feet west and

1,850 feet south of the northeast corner of sec. 20, T. 97 N., R. 77 W.:

A11—0 to 4 inches; dark grayish brown (10YR 4/2) loamy fine sand, black (10YR 2/1) moist; weak coarse granular structure; soft, loose; slightly acid; clear smooth boundary.

A12—4 to 11 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak medium and fine granular; soft, loose; slightly acid; clear smooth boundary.

AC1—11 to 20 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; loose; neutral; gradual wavy boundary.

AC2—20 to 35 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to single grained; loose; neutral; gradual wavy boundary.

C—35 to 60 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose; neutral.

The A horizon is very dark grayish brown or dark grayish brown and is 10 to 15 inches thick. The AC horizon commonly is dark grayish brown or very dark grayish brown, but in places the lower part is grayish brown or brown. It is 15 to 30 inches thick. The C horizon is grayish brown to pale brown and is loamy fine sand or fine sand. Some pedons have a buried A horizon within the C horizon. In places sandstone or siltstone is at a depth of 40 to 60 inches.

Doger soils are mapped with or near Anselmo, Dunday, Elsmere, Ronson, and Valentine soils. They are more sandy than Anselmo and Ronson soils. When moist, Doger soils are dark to a greater depth than Dunday and Valentine soils. They are better drained than Elsmere soils.

DgB—Doger loamy fine sand, 0 to 6 percent slopes. This soil is nearly level to undulating. Areas are irregular in shape and are 20 to 40 acres in size. Slopes are short and convex. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Anselmo, Dunday, and Vetal soils. Anselmo and Dunday soils are on the crests of some undulations. Vetal soils are in some swales. Gumbo or scabby spots, outcrops of sandstone, sand blowouts, and wet spots are shown on the soil maps by spot symbols.

Runoff is slow, and most of the rainfall enters the soil. This soil is easy to work, but it is subject to severe soil blowing. Controlling soil blowing is the main concern in management.

About half of the acreage of this soil is in cultivated crops, mainly alfalfa, corn, and oats. Areas in native grass are used for grazing and hay. Capability unit IVe–9; Sandy range site.

DmA—Doger-Elsmere complex, 0 to 3 percent slopes. Areas of this complex are irregular in shape and are 40 to 450 acres in size. They commonly contain many slight undulations, broken by swales or low spots. This complex is about 50 percent Doger soil, 40 percent Elsmere soil, and 10 percent other soils. The Doger soil is on slight rises, and the Elsmere soil is in low areas. The Doger soil has a surface layer of loamy fine sand, and the Elsmere soil has a surface layer of fine sandy loam.

Included with these soils in mapping are small areas of Dunday, Orwet, Ronson, and Whitelake soils. Dunday soils are the most extensive and are on the crests of some undulations. Orwet and Whitelake soils are in some low areas. Ronson soils are on the edges of areas that are near Holt soils.

Runoff is slow, and most of the rainfall enters the soil. These soils are subject to soil blowing. In some years wetness from a water table limits the Elsmere soil for crops. Controlling soil blowing is the main concern in management.

Most areas of this complex remain in native grass and are used for grazing and hay. Alfalfa is the main cultivated crop. Capability unit IVe–9; Doger part in Sandy range site, Elsmere part in Subirrigated range site.

Dunday series

The Dunday series consists of deep, undulating to gently rolling, well drained to excessively drained, sandy soils on uplands. These soils formed in eolian sand (fig. 10). The native vegetation is mainly mid and tall grasses.

In a representative profile the surface layer is dark grayish brown loamy fine sand about 12 inches thick. Below this is a transitional layer of grayish brown loamy fine sand about 8 inches thick. The underlying material is brown loamy fine sand.

Dunday soils are low in fertility and moderately low in content of organic matter. Permeability is moderately rapid or rapid, and available water capacity is low or moderate.

Most areas of these soils remain in native grass and are used for grazing and hay. Some of the smoother areas are in crops.

Representative profile of Dunday loamy fine sand in an area of Valentine-Dunday complex, 3 to 9 percent slopes, in cultivation, 1,320 feet north and 200 feet west of the southeast corner of sec. 15, T. 98 N., R. 78 W.:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium granular structure parting to single grained; soft, loose; slightly acid; abrupt smooth boundary.

A12—5 to 12 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to single grained; soft, loose; slightly acid; clear smooth boundary.

AC—12 to 20 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; very weak medium

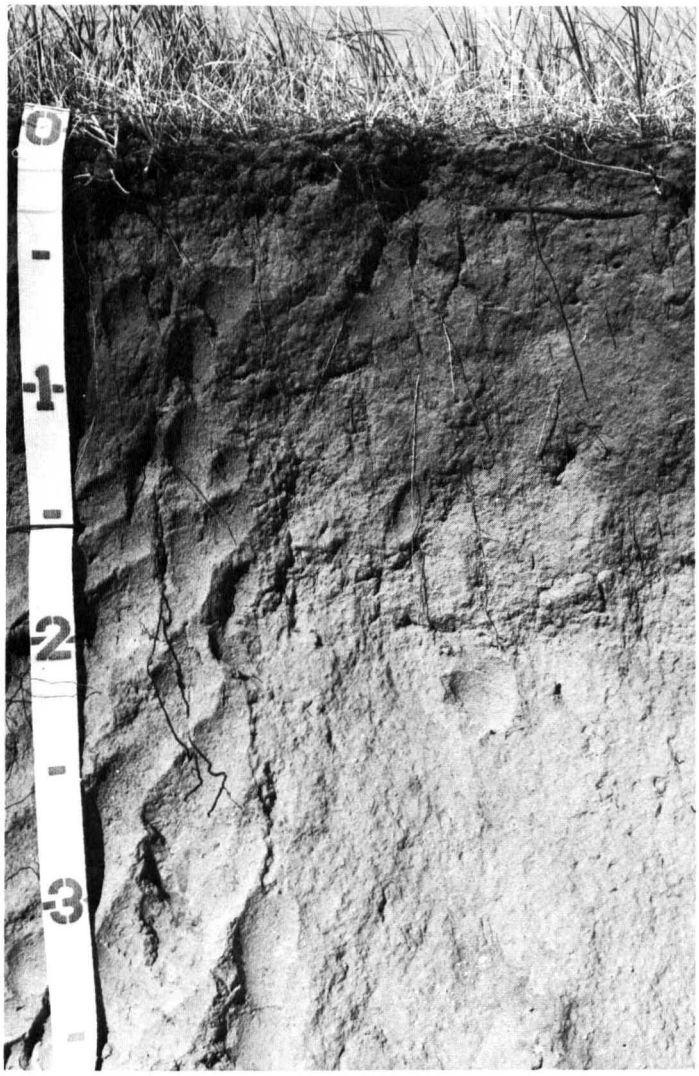

Figure 10.—**Profile of Dunday loamy fine sand in an area of Dunday-Doger loamy fine sands, 3 to 9 percent slopes.**

and fine subangular blocky structure; loose; neutral; gradual wavy boundary.

C—20 to 60 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; single grained; loose; neutral.

The A horizon is dark grayish brown or grayish brown, and in places the upper part is fine sandy loam. It is 10 to 16 inches thick. The AC horizon is grayish brown or brown and is 6 to 12 inches thick. The C horizon is grayish brown to pale brown and is loamy fine sand or fine sand. Some pedons have a buried A horizon within the C horizon. In places soft sandstone is at a depth of 40 to 60 inches.

Dunday soils are mapped with or near Anselmo, Doger, Elsmere, and Valentine soils. Dunday soils have more sand than Anselmo soils. When moist, Dunday soils are dark to a shallower depth than Doger soils. They are better drained than Elsmere soils, and they have a darker colored and thicker A horizon than Valentine soils.

DnC2—Dunday loamy fine sand, 3 to 9 percent slopes, eroded. This soil is undulating to gently rolling. Areas are generally rectangular in shape and are 75 to 300 acres in size. They coincide with old field boundaries. This soil is moderately eroded to severely eroded and part or all of the surface layer has been removed by soil blowing and redeposited in small hummocks and along fence lines. The surface layer is uneven in many areas because of the hummocks of windblown sand.

Included with this soil in mapping are small areas of Doger, Valentine, and Vetal soils. Doger and Vetal soils are in low areas and swales. Valentine soils are on the crests of some undulations. Outcrops of sandstone and sand blowouts are shown on the soil map by spot symbols.

Runoff is slow, and most of the rainfall enters the soil. This soil is subject to soil blowing if the plant cover is disturbed. Controlling soil blowing is the main concern in management.

Most areas of this soil were formerly cultivated but are now in native grass and weeds. A few areas have been smoothed and are used for alfalfa and oats. Capability unit VIe–7; Sands range site.

DuC—Dunday-Doger loamy fine sands, 3 to 9 percent slopes. These soils are undulating to gently rolling. Areas are irregular in shape and are 100 to 250 acres in size. This complex is about 50 percent Dunday soil, 40 percent Doger soil, and 10 percent other soils. Slopes are short and convex. The Dunday soil is on the higher part of the landscape, and the Doger soil is on foot slopes and in swales.

Included with these soils in mapping are small areas of Valentine and Vetal soils. Valentine soils are the most extensive and are on the higher undulations. Vetal soils are in some swales. Sand blowouts are in some areas and are shown on the soil map by a spot symbol.

Runoff is slow, and most of the rainfall enters the soil. These soils are subject to severe soil blowing if adequate plant cover is not maintained. Controlling soil blowing is the main concern in management.

Nearly all of these soils are in native grass and are used for grazing and hay. Dunday part in capability unit VIe–7, Sands range site; Doger part in capability unit IVe–9, Sandy range site.

Elsmere series

The Elsmere series consists of deep, nearly level, somewhat poorly drained, loamy soils on bottom lands and in broad basins. These soils formed in sandy material. The native vegetation is mainly tall grasses.

In a representative profile the surface layer is dark gray, calcareous fine sandy loam and sandy loam about 12 inches thick. Below this is a transitional layer of light brownish gray, calcareous loamy fine sand. The underlying material is light gray loamy fine sand.

Elsmere soils are medium in fertility and moderately low in content of organic matter. Permeability is rapid, and available water capacity is low or moderate. Depth to the water table ranges from 2 to 6 feet.

About half of the acreage is farmed. Other areas remain in native grass and are used for grazing and hay.

Representative profile of Elsmere fine sandy loam, in native grass, 115 feet east and 777 feet north of the southwest corner of sec. 32, T. 98 N., R. 76 W.:

A11—0 to 4 inches; dark gray (10YR 4/1) fine sandy loam, black (10YR 2/1) moist; weak medium granular structure; soft, very friable; slight effervescence; mildly alkaline; clear smooth boundary.

A12—4 to 9 inches; dark gray (10YR 4/1) fine sandy loam, black (10YR 2/1) moist; weak fine subangular blocky structure; soft, very friable; slight effervescence; mildly alkaline; clear smooth boundary.

A13—9 to 12 inches; dark gray (10YR 4/1) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable; slight effervescence; mildly alkaline; abrupt wavy boundary.

AC—12 to 22 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; slightly hard; neutral; diffuse wavy boundary.

C—22 to 60 inches; light gray (10YR 7/2) loamy fine sand, light brownish gray (10YR 6/2) moist; common medium faint mottles of brown and dark brown; single grained; hard, loose; neutral.

Free carbonates are at a depth of 0 to 40 inches. In places where the A horizon is calcareous, the lower part of the profile commonly is noncalcareous. The A horizon is dark gray to grayish brown and in places is loamy fine sand. It is 10 to 16 inches thick. The AC horizon is grayish brown in places and is loamy fine sand or fine sand. It is 8 to 16 inches thick. The C horizon is light gray or very pale brown loamy fine sand or fine sand. Mottles in the C horizon are few to many and faint to distinct. In places finer textured layers are in the lower part of the C horizon below a depth of 40 inches.

Elsmere soils are mapped with or near Doger, Dunday, Lute, Valentine, Vetal, and Whitelake soils and are similar to Wann soils. They are more poorly drained than Doger, Dunday, Valentine, and Vetal soils. Elsmere soils do not have columnar structure in the B horizon, as Lute and Whitelake soils do, and they contain less sodium than those soils. They are more sandy than Wann soils.

Em—Elsmere fine sandy loam (0 to 2 percent slopes). This soil is on bottom lands. Areas are 40 to more than 400 acres in size. Some are irregular in shape and some are long and narrow. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Doger, Orwet, and Whitelake soils. Doger soils are on slight rises. Orwet soils are in some low areas. Whitelake soils are near the edges of some areas and are shown on the soil map by the symbol for gumbo or scabby spots. In some areas low, wet spots that are ponded most of the year also are shown by the spot symbol for marsh.

Runoff is slow, and most of the rainfall enters the soil. This soil is subject to soil blowing. During wet years the high water table limits use. Controlling soil blowing is the main concern in management.

About half of the acreage is in cultivated crops, mainly alfalfa and oats. Areas in native grass are used for grazing and hay. Capability unit IVe–10; Subirrigated range site.

Epping series

The Epping series consists of shallow, moderately sloping to moderately steep, well drained, silty soils on uplands. These soils formed in material weathered from underlying siltstone. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is grayish brown silt loam about 4 inches thick. Below this is a transitional layer of pale brown silt loam about 4 inches thick. The underlying material to a depth of 12 inches is pale brown silt loam. Very pale brown siltstone is at a depth of 12 inches.

Epping soils are low in fertility and in content of organic matter. Permeability is moderate above the siltstone, and available water capacity is very low.

Most areas of these soils remain in native grass and are used for grazing. In some areas where they are intermingled with arable soils, Epping soils are farmed.

Representative profile of Epping silt loam in an area of Epping soils, 12 to 25 percent slopes, in native grass, 225 feet east and 150 feet south of the northwest corner of sec. 3, T. 95 N., R. 79 W.:

A1—0 to 4 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium and fine granular structure; soft, very friable; mildly alkaline; clear wavy boundary.

AC—4 to 8 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak coarse blocky structure parting to weak medium blocky; soft, very friable; mildly alkaline; clear wavy boundary.

C—8 to 12 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; massive; very friable; mildly alkaline; clear wavy boundary.

Cr—12 to 60 inches; very pale brown (10YR 7/3) siltstone bedrock, brown (10YR 5/3) moist; platy bedrock structure; brittle; moderately alkaline; slight effervescence.

Siltstone is at a depth of 10 to 20 inches. The horizons above the siltstone commonly are silt loam, but they are loam in some pedons. In places these horizons contain fine fragments of siltstone. The A horizon is light brownish gray or light gray silt loam, loam, or silty clay loam 3 to 6 inches thick. The AC horizon is light brownish gray or pale brown and is silt loam or silty clay loam 4 to 7 inches thick. The C horizon is light brownish gray to very pale brown and is 3 to 6 inches thick. The Cr horizon is very pale brown or white and is weakly cemented to moderately cemented.

Epping soils in Tripp County lack free carbonates in the horizons above the siltstone, in contrast to the

presence of free carbonates that is defined in the range for the series. This difference does not alter their usefulness and behavior.

Epping soils are near Huggins, Kadoka, and Shena soils. They are shallower to siltstone than Huggins and Kadoka soils and contain less clay than Shena soils.

EpE—Epping soils, 12 to 25 percent slopes. These strongly sloping to moderately steep soils are on the sides of upland ridges and entrenched drainageways. Areas are irregular in shape and are 75 to more than 300 acres in size. The surface layer differs from one area to another and is silt loam, silty clay loam, or loam.

Included with these soils in mapping are Dix, Huggins, Kadoka, Shena, and Wortman soils. Dix soils are on high ridgetops in some areas and are shown on the soil map by a gravel spot symbol. Huggins, Kadoka, and Shena soils are on wide ridgetops and in the lower part of the landscape below Epping soils. Wortman soils are on foot slopes. Gumbo or scabby spots and outcrops of cemented siltstone are in some areas and also are shown on the soil map by spot symbols.

Runoff is rapid. These soils generally are not suited to farming because of their high susceptibility to water erosion and their shallow depth. Controlling water erosion is the main concern of management.

All areas of these soils remain in native grass and are used for grazing. Capability unit VIe–11; Shallow range site.

Erd series

The Erd series consists of deep, nearly level, somewhat poorly drained, clayey soils on stream terraces. These soils formed in alluvium. The native vegetation is mainly mid grasses.

In a representative profile the surface layer is dark gray clay about 3 inches thick. The subsoil is gray, calcareous clay about 25 inches thick. The underlying material to a depth of 37 inches is olive gray, calcareous clay. Light brownish gray, calcareous clay is at a depth of 37 inches. The lower part of the subsoil and the underlying material contain nests of salt crystals.

Erd soils are medium in fertility and moderate in content of organic matter. Permeability is very slow, and available water capacity is low or moderate. These soils have a seasonal water table at a depth of 2 to 5 feet.

Most areas of these soils are in cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Erd clay, in native grass, 100 feet south and 75 feet west of the northeast corner of sec. 35, T. 100 N., R. 77 W.:

A1—0 to 3 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to moderate fine granular; very hard, very firm, very sticky and very plastic; mildly alkaline; clear smooth boundary.

B21g—3 to 10 inches; gray (5Y 5/1) clay, very dark gray (5Y 3/1) moist; moderate coarse blocky structure parting to moderate medium and fine blocky; extremely hard, extremely firm, very sticky and very plastic; slight effervescence; moderately alkaline; gradual smooth boundary.

B22g—10 to 20 inches; gray (5Y 5/1) clay, very dark gray (5Y 3/1) moist; weak very coarse blocky structure parting to strong medium and fine blocky; extremely hard, extremely firm, very sticky and very plastic; slight effervescence; mildly alkaline; diffuse smooth boundary.

B3gsa—20 to 28 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; weak coarse blocky structure; extremely hard, extremely firm, very sticky and very plastic; common medium nests of salt crystals; slight effervescence; mildly alkaline; diffuse smooth boundary.

C1sa—28 to 37 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; massive; extremely hard, extremely firm, very sticky and very plastic; common medium nests of salt crystals; strong effervescence; mildly alkaline; diffuse smooth boundary.

C2sa—37 to 60 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; few fine faint mottles of gray (N 5/0) and brown (10YR 5/3) moist; massive; extremely hard, extremely firm, very sticky and very plastic; common fine nests of salt crystals; strong effervescence; mildly alkaline.

Some pedons are calcareous at the surface. When the soil is dry, cracks as much as 2 inches wide and several feet long extend through the B horizon. Exchangeable sodium in the B and C horizons is less than 15 percent. The A horizon is dark gray to grayish brown in hue of 10YR or 2.5Y and is clay or silty clay. It is 2 to 6 inches thick. The B2g horizon is dark gray to olive gray in hue of 5Y or 2.5Y and is 10 to 22 inches thick. The B3gsa horizon is gray to light olive gray in hue of 5Y or 2.5Y and is 6 to 12 inches thick. The C horizon is gray to light gray in hue of 5Y or 2.5Y. Nests of salt crystals in the B3 and C horizons range from few to many.

Erd soils are mapped with or near Carter, Hurley, Millboro, Promise, and Witten soils and are similar to Kolls soils. They are more poorly drained than Carter, Hurley, Millboro, Promise, and Witten soils and contain less sodium than Hurley soils. Erd soils are better drained and contain more salts than Kolls soils.

Er—Erd clay (0 to 1 percent slopes). This soil is on stream terraces. Areas are mostly long and narrow. They are 30 to more than 300 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Carter, Promise, and Witten soils. Carter soils are in slightly concave, low areas. Promise soils are on slight rises. Witten soils are on the edges of the mapped areas. Gumbo or scabby spots are in some

mapped areas and are shown on the soil map by a spot symbol.

Runoff is slow, and this soil takes in water slowly. Wetness from a seasonal water table or from runoff received from adjacent soils delays farming in some years. This soil is difficult to work and loses tilth if farmed when wet. When dry it is subject to soil blowing. Controlling wetness in spring, maintaining good tilth, and improving water intake are the main concerns in management.

Most areas of this soil are in cultivated crops, mainly alfalfa and winter wheat. Areas in native grass are used for grazing and hay. Capability unit IIIw–3; Clayey range site.

Es—Erd-Hurley complex (0 to 2 percent slopes). This complex is on low terraces along drainageways. Areas are mostly long and narrow. They are 100 to 400 acres in size. This complex is about 60 percent Erd soils, 25 percent Hurley soils, and 15 percent other soils. Erd soils have a clay surface layer and are in places where the slopes are smooth. Hurley soils have a silt loam surface layer and are in places where the surface layer is uneven because of small, low mounds that rise a few inches above the intervening low spots. A Hurley soil in this complex has the profile described as representative of the Hurley series.

Included with these soils in mapping are Carter, Promise, and Witten soils. Carter soils are on very slight rises. Promise soils are on some of the higher rises. Witten soils are in swales near the edges of the mapped areas as they merge into the adjacent uplands.

Runoff is slow, and these soils take in water slowly. Wetness from a seasonal water table or from runoff received from nearby soils delays farming in some years. Runoff commonly collects on the Hurley soil after heavy rains and remains until it evaporates. These soils are difficult to work and the Hurley soil has very poor tilth. Controlling wetness, maintaining tilth, and improving water intake are the main concerns in management.

Most areas of this complex remain in native grass and are used for grazing. Alfalfa and winter wheat are the main crops in cultivated areas. The Hurley soil has a high content of sodium and is not suited to cultivation. Native trees and shrubs are along the drainageway channel in some areas and provide food and cover for wildlife. Erd part in capability unit IIIw–3, Clayey range site; Hurley part in capability unit VIs–1, Thin Claypan range site.

Haverson series

The Haverson series consists of deep, nearly level, well drained, loamy soils on bottom lands. These soils formed in alluvium. The native vegetation is mainly a mixture of tall, mid, and short grasses. Scattered clumps of native trees are in some areas.

In a representative profile the surface layer is grayish brown and dark grayish brown loam about 7 inches thick. The underlying material to a depth of 53 inches is stratified grayish brown loam and pale brown and brown silt loam. Pale brown very fine sandy loam is at a depth of 53 inches. The entire profile is calcareous.

Haverson soils are low in fertility and in content of organic matter. Permeability is moderate, and available water capacity is high. Most areas are subject to flooding in some years.

Most areas of these soils are in cultivated crops and a few areas are irrigated. Areas in native grass are used for grazing and hay.

Representative profile of Haverson loam in an area of Haverson soils, in native grass, 1,900 feet east and 600 feet north of the southwest corner of sec. 26, T. 103 N., R. 76 W.:

A11—0 to 5 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium granular structure; slightly hard, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

A12—5 to 7 inches; grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, very friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

C1—7 to 10 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure parting to weak fine subangular blocky; slightly hard, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

C2—10 to 35 inches; pale brown (10YR 6/3) silt loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

C3—35 to 45 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; slightly hard, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

C4—45 to 53 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; massive; soft, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

C5—53 to 60 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; strong effervescence; moderately alkaline.

The A horizon is grayish brown or light grayish brown in hue of 10YR or 2.5Y and is dominantly loam but ranges from very fine sandy loam to silty clay loam. It is 4 to 8 inches thick. The C horizon to a depth of 40 inches is dominantly silt loam and is stratified with loam or very fine sandy loam.

Haverson soils in Tripp County contain slightly less clay and sand than is defined in the range for the series and are in an area of higher precipitation. These differences do not greatly alter their usefulness or behavior.

Haverson soils are mapped near Bankard, Munjor, Promise, and Swanboy soils. They contain less sand than Bankard and Munjor soils and less clay than Promise and Swanboy soils.

Ha—Haverson soils (0 to 2 percent slopes). These soils are on bottom lands along the White River. Areas are 50 to more than 300 acres in size. Some are long and narrow, and some are irregular in shape. The surface layer is mostly silty clay loam, but in some areas it is loam. In other areas the surface layer ranges from very fine sandy loam to silty clay loam.

Included with these soils in mapping are small areas of Munjor soils on very slight rises.

Runoff is slow. These soils are subject to flooding in some years but the additional moisture generally is beneficial and flood damage is minor. These soils also are low in fertility and are subject to soil blowing if there is no plant cover or crop residue. Conserving moisture is the main concern in management.

Most areas of these soils are used for alfalfa, oats, and sorghum. Capability unit IIc–1; Overflow range site.

Holt series

The Holt series consists of moderately deep, nearly level to moderately sloping, well drained, loamy soils on uplands. These soils formed in material weathered from underlying calcareous sandstone. The native vegetation is mainly mid and tall grasses.

In a representative profile (fig. 11) the surface layer is very dark grayish brown fine sandy loam about 6 inches thick. The subsoil is fine sandy loam about 16 inches thick; it is dark grayish brown in the upper part and grayish brown in the lower part. The underlying material to a depth of 28 inches is grayish brown, calcareous fine sandy loam that contains fragments of sandstone. Light gray, calcareous sandstone is at a depth of 28 inches.

Holt soils are medium in fertility and moderate in content of organic matter. Permeability is moderate or moderately rapid, and available water capacity is low.

About half of the acreage is in cultivated crops. Some areas remain in native grass and are used for grazing and hay.

Representative profile of Holt fine sandy loam in an area of Holt-Anselmo fine sandy loams, 0 to 3 percent slopes, in native grass, 50 feet north and 2,415 feet west of the southeast corner of sec. 21, T. 96 N., R. 75 W.:

A1—0 to 6 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak medium and coarse subangular blocky structure parting to weak and moderate medium granular; soft, very friable; neutral; clear smooth boundary.

B21t—6 to 11 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; neutral; clear smooth boundary.

B22t—11 to 16 inches; dark grayish brown (10YR 4/2) heavy fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak and moderate medium subangular blocky and blocky; slightly hard, friable; mildly alkaline; clear wavy boundary.

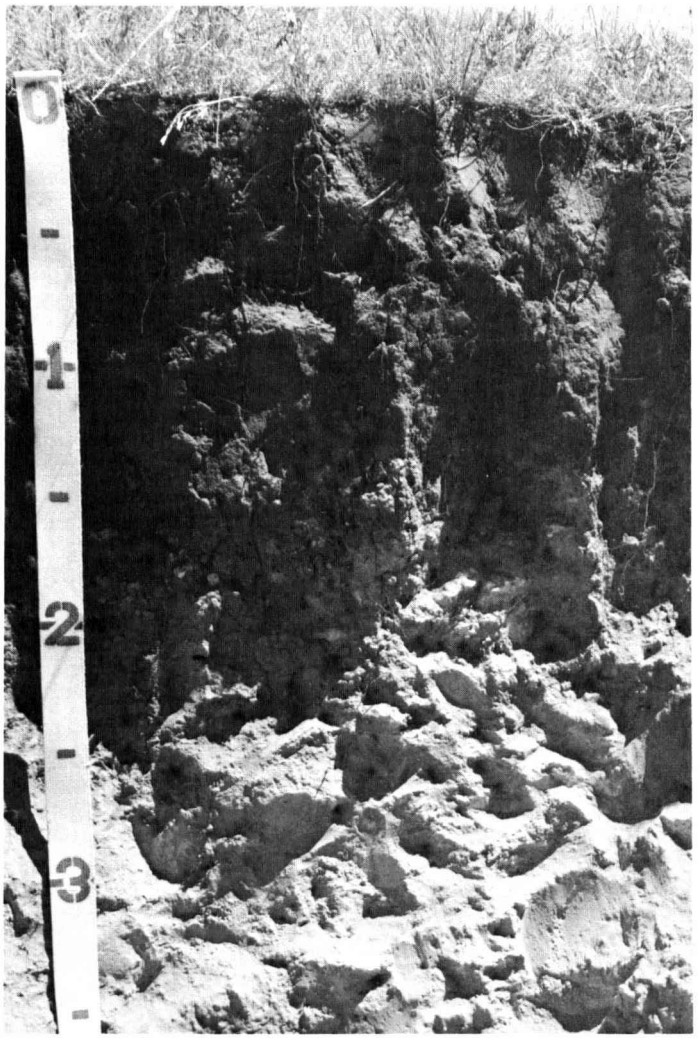

Figure 11.—**Profile of Holt fine sandy loam in an area of Holt-Anselmo fine sandy loams, 0 to 3 percent slopes.**

B3—16 to 22 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; slightly hard, very friable; mildly alkaline; abrupt wavy boundary.

C—22 to 28 inches; grayish brown (10YR 5/2) fine sandy loam and light gray (10YR 7/2) rock fragments, dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) moist; massive; bedding planes evident; strong effervescence; moderately alkaline; clear wavy boundary.

Cr—28 to 60 inches; light gray (10YR 7/2) sandstone, grayish brown (10YR 5/2) moist; strong effervescence; moderately alkaline.

Sandstone is at a depth of 20 to 36 inches. Free carbonates are at a depth of 16 to 28 inches. A few fragments of cemented sandstone as much as 3 inches in diameter are throughout the solum in some pedons. The A horizon is very dark grayish brown or dark grayish brown and in places is loamy fine sand. It is about 5 to 7 inches thick. The B2t horizon is dark grayish brown or grayish brown and is 9 to 14 inches thick. The B3 horizon is grayish brown to light gray. The C horizon is grayish brown to white and is fine sandy loam or loamy fine sand. It is 40 to 60 percent sandstone fragments. The sandstone is light gray or white and is weakly cemented to moderately cemented.

Holt soils are mapped with or near Anselmo, Manter, Ronson, Tassel, and Vetal soils. They are shallower to sandstone than Anselmo, Manter, and Vetal soils and are deeper to sandstone than Tassel soils. In contrast to Ronson soils, Holt soils are more clayey in the B horizon than in the A horizon.

HbA—Holt-Anselmo fine sandy loams, 0 to 3 percent slopes. Areas of this complex are irregular in shape and are 100 to more than 200 acres in size. Slopes are gently undulating. This complex is about 60 percent Holt soil, 30 percent Anselmo soil, and 10 percent other soils. These soils are closely intermingled throughout the mapped areas.

Included with these soils in mapping are small areas of Vetal and Tassel soils. Vetal soils are in swales. Tassel soils are on low ridges. Small wet spots and outcrops of sandstone are in some areas and are shown on the soil map by spot symbols.

Runoff is slow, and most of the rainfall enters the soil. These soils are easy to work, but they are subject to soil blowing. Controlling soil blowing is the main concern in management.

About half of the acreage is in cultivated crops, mainly alfalfa, corn, and oats. Areas in native grass are used for grazing and hay. Capability unit IIIe–9; Sandy range site.

Huggins series

The Huggins series consists of moderately deep, nearly level to moderately sloping, well drained, silty soils on uplands. These soils formed in material weathered from underlying siltstone. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 15 inches thick; the upper part is grayish brown silty clay loam, the middle part is grayish brown silty clay, and the lower part is light brownish gray silty clay. The underlying material to a depth of 28 inches is very pale brown clay loam. Very pale brown siltstone is at a depth of 28 inches.

Huggins soils are medium in fertility and moderate in content of organic matter. Permeability is moderately slow, and available water capacity is low.

About half of the acreage is in cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Huggins silt loam in an area of Huggins-Kadoka silt loams, 3 to 9 percent slopes, in native grass, 800 feet south and 200 feet east of the northwest corner of sec. 32, T. 96 N., R. 78 W.:

A1—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium granular structure; soft, very friable; neutral; clear smooth boundary.

B21t—6 to 8 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate very fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common tongues of dark grayish brown; neutral; clear smooth boundary.

B22t—8 to 15 inches; grayish brown (10YR 5/2) silty clay, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate coarse blocky; hard, firm, sticky and plastic; few tongues of dark grayish brown; few fine fragments of siltstone; neutral; gradual smooth boundary.

B3—15 to 21 inches; light brownish gray (10YR 6/2) silty clay, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, firm, sticky and plastic; common fine fragments of siltstone; mildly alkaline; clear smooth boundary.

C—21 to 28 inches; very pale brown (10YR 7/3) clay loam, pale brown (10YR 6/3) moist; massive; hard, friable, slightly sticky; common fine fragments of siltstone; mildly alkaline; abrupt smooth boundary.

Cr—28 to 60 inches; very pale brown (10YR 8/3) siltstone bedrock, light yellowish brown (10YR 6/4) moist; strong effervescence; moderately alkaline.

Siltstone is at a depth of 20 to 30 inches. The A horizon is dark grayish brown or grayish brown and in places is silty clay loam. It is 5 to 7 inches thick. The B2t horizon is grayish brown or dark grayish brown and is 8 to 14 inches thick. The B3 horizon is grayish brown to pale brown and in places is silty clay loam or clay loam. In the B3 and C horizons fragments and particles of siltstone range from 15 to 60 percent by volume. The C horizon is pinkish gray to very pale brown in hue of 10YR or 7.5YR. It is clay loam, gravelly clay loam, or gravelly loam. The siltstone has strata of differing hardness and in places is noncalcareous.

Huggins soils are mapped with or near Epping, Kadoka, Shena, and Wortman soils. They are deeper to siltstone than Epping and Shena soils, and they are more clayey in the B horizon than Kadoka soils. Huggins soils contain less sodium in the B and C horizons than Wortman soils.

HgA—Huggins silt loam, 0 to 3 percent slopes. Areas of this soil are irregular in shape and are 50 to 150 acres in size. Slopes are nearly level to very gently sloping. This soil has a thicker subsoil and is slightly deeper to siltstone than the soil described as representative of the series.

Included with this soil in mapping are small areas

of Kadoka, Shena, Wanblee, and Wortman soils. Kadoka soils are closely intermingled with the Huggins soil throughout the mapped areas. Shena soils are on slight rises. Wanblee and Wortman soils are in slightly concave, low areas. Gumbo or scabby spots and small wet spots are shown on the soil map by spot symbols.

Runoff is slow to medium. This soil is somewhat droughty because the underlying siltstone restricts penetration of roots and water. Conserving moisture is the main concern in management.

Most areas of this soil remain in native grass and are used for grazing and hay. Alfalfa and small grain are the main cultivated crops. Capability unit IIIs–5; Clayey range site.

HkB—Huggins-Kadoka silt loams, 3 to 9 percent slopes. Areas of this complex are irregular in shape and are 50 to 200 acres in size. The moderately long slopes are mostly gently sloping but some are moderately sloping. This complex is about 45 percent Huggins soil, 40 percent Kadoka soil, and 15 percent other soils. The Huggins soil is on the tops and upper sides of convex ridges. The Kadoka soil is in the mid and lower parts of the landscape. The Huggins soil has the profile described as representative of the Huggins series.

Included with these soils in mapping are small areas of Keya, Ree, Shena, and Wortman soils. Keya and Wortman soils are in swales and low areas. Ree soils are on some of the wider ridges. Shena soils are on some ridgetops. Outcrops of siltstone and small wet spots are in some areas and are shown on the soil map by spot symbols.

Runoff is medium. These soils are easy to work, but they are subject to water erosion. The Huggins soil is droughty. Controlling water erosion and conserving moisture are the main concerns in management.

Most areas of this complex remain in native grass and are used for grazing or hay. Alfalfa and small grain are the main cultivated crops. Capability unit IIIe–12; Huggins part in Clayey range site, Kadoka part in Silty range site.

Hurley series

The Hurley series consists of deep, nearly level, moderately well drained soils that have a claypan subsoil. These soils are on terraces and in swales. They formed in clayey materials that weathered from clayey shale. The native vegetation is mainly short and mid grasses.

In a representative profile the surface layer is gray silt loam about 3 inches thick. The subsoil is dark gray clay about 15 inches thick. The lower part is calcareous. The underlying material is gray and olive, calcareous clay. Salt crystals are scattered throughout the lower part of the subsoil and in the underlying material.

Hurley soils are low in fertility and moderate in content of organic matter. Permeability is very slow, and available water capacity is low or moderate.

Nearly all areas of these soils remain in native grass and are used for grazing.

Representative profile of Hurley silt loam in an area of Erd-Hurley complex, in native grass, 350 feet north and 100 feet west of the southeast corner of sec. 7, T. 100 N., R. 77 W.:

A2—0 to 3 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak medium platy structure parting to moderate medium granular; hard, friable; neutral; abrupt smooth boundary.

B2t—3 to 10 inches; dark gray (10YR 4/1) clay, very dark grayish brown (10YR 3/2) moist; gray (10YR 5/1) coatings on tops and upper sides of peds; moderate medium columnar structure parting to moderate medium blocky; extremely hard, extremely firm, sticky and very plastic; mildly alkaline; abrupt wavy boundary.

B3sa—10 to 18 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak medium blocky structure; extremely hard, extremely firm, sticky and very plastic; few fine nests of salt crystals; slight effervescence; strongly alkaline; gradual wavy boundary.

C1sa—18 to 30 inches; gray (10YR 5/1) clay, dark grayish brown (10YR 4/2) moist; massive; extremely hard, extremely firm, sticky and very plastic; few fine nests of salt crystals; strong effervescence; strongly alkaline; gradual wavy boundary.

C2sa—30 to 45 inches; gray (10YR 5/1) clay, dark grayish brown (10YR 4/2) moist; massive; extremely hard, extremely firm, sticky and plastic; few fine nests of salt crystals; strong effervescence; moderately alkaline; gradual wavy boundary.

C3sa—45 to 60 inches; olive (5Y 5/3) clay, olive (5Y 4/3) moist; massive; extremely hard, extremely firm, sticky and plastic; common nests of salt crystals; strong effervescence; moderately alkaline.

Free carbonates are at a depth of 5 to 12 inches. Shale is at a depth of 36 to 60 inches or more. The A2 horizon is gray or grayish brown and is 2 to 4 inches thick. The B2t horizon is dark gray or dark grayish brown and is 5 to 8 inches thick. The B3 horizon is dark gray to grayish brown. The C horizon is gray, grayish brown, or olive and is moderately alkaline or strongly alkaline. Nests of salts in the B3 and C horizons range from few to many.

Hurley soils are mapped with or near Carter, Erd, Millboro, Promise, and Witten soils. They are similar to Jerauld and Wanblee soils. Hurley soils have a thinner A horizon and contain more sodium in the B horizon than Carter soils. They have columnar structure in the B horizon and contain more sodium than Erd, Millboro, Promise, and Witten soils. Hurley soils are more clayey in the B horizon than Jerauld and Wanblee soils.

Hr—Hurley silt loam (0 to 2 percent slopes). This nearly level soil is in swales and on flats along drainageways. Areas are irregular in shape and are 20 to 200 acres in size. Some areas have stream channels that are 3 to 8 feet deep and 6 to 20 feet wide. The surface layer commonly is uneven because of many

small mounds that rise several inches above the intervening low spots.

Included with this soil in mapping are small areas of Carter, Promise, and Witten soils. Carter and Promise soils are on some very slight rises. Witten soils are in narrow swales.

Runoff is slow and water ponds in the small, low spots in wet seasons. This soil takes in water slowly and releases moisture slowly to plants. Tilth is very poor and the soil is not suited to farming.

All areas of this soil remain in native grass and are used for grazing. Many of the small, low spots have little or no vegetation. Capability unit VIs–1; Thin Claypan range site.

Inavale series

The Inavale series consists of deep, nearly level, somewhat excessively drained, sandy soils on bottom lands. These soils formed in alluvium. The native vegetation is mainly mid and tall grasses. Scattered native trees and shrubs are along the channels in many areas.

In a representative profile the surface layer is grayish brown loamy fine sand about 8 inches thick. Below this is a transitional layer, about 8 inches thick, that is light brownish gray fine sand in the upper part and grayish brown loamy fine sand in the lower part. The underlying material is light brownish gray and very pale brown, stratified fine and medium sand.

Inavale soils are low in fertility and in content of organic matter. Permeability is rapid, and available water capacity is low. Some areas are subject to flooding.

Most areas of these soils remain in native grass and are used for grazing. A few areas are used for crops.

Representative profile of Inavale loamy fine sand, 1,100 feet east and 2,500 feet south of the center of sec. 27, T. 95 N., R. 75 W.:

A1—0 to 8 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure parting to weak medium granular; soft, loose; neutral; abrupt smooth boundary.

AC1—8 to 13 inches; light brownish gray (10YR 6/2) fine sand, brown (10YR 5/3) moist; single grained; loose; neutral; abrupt smooth boundary.

AC2—13 to 16 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure parting to single grained; soft, loose; neutral; abrupt smooth boundary.

C1—16 to 22 inches; light brownish gray (10YR 6/2) fine sand, brown (10YR 5/3) moist; single grained; loose; neutral; abrupt smooth boundary.

C2—22 to 60 inches; very pale brown (10YR 7/3) fine and medium sand, pale brown (10YR 6/3) moist; single grained; loose; neutral.

Reaction is neutral or mildly alkaline throughout the profile. The A horizon is dark grayish brown to light brownish gray and is fine sandy loam, loamy fine sand, or fine sand. It is 5 to 12 inches thick. The AC and C horizons are stratified with loamy fine sand to medium sand. In places a small amount of gravel is in the C horizon.

Inavale soils are near Cass, Doger, and Dunday soils and are similar to Bankard and Valentine soils. In contrast to Bankard soils, Inavale soils lack free carbonates. They are more sandy than Cass soils and are lighter colored and more stratified than Doger and Dunday soils. Inavale soils are more stratified than Valentine soils.

Ia—Inavale loamy fine sand (0 to 2 percent slopes). This soil is on bottom lands along the Keya Paha River. Areas are 15 to 150 acres in size. The nearly level slopes are broken by gentle undulations in many areas. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Cass, Doger, and Wann soils. Cass soils are in low areas that are on the edges of the bottom lands. Doger soils are on some of the more pronounced undulations. Wann soils are along tributary drainageways that enter the Keya Paha River valley. Sand blowouts are in some areas and are shown on the soil map by a spot symbol.

Runoff is slow, and most of the rainfall enters the soil. This soil is low in fertility. The hazard of soil blowing is severe. Controlling soil blowing and maintaining fertility and content of organic matter are the main concerns in management.

Most areas of this soil remain in native grass and are used for grazing. Alfalfa and small grain are the main cultivated crops. Capability unit IVe–9; Sands range site.

Ic—Inavale complex, channeled (0 to 2 percent slopes). This complex is on bottom lands. Areas are narrow. They are 50 to 100 acres in size. The mapped areas are dissected into small parcels by meandering channels that are 5 to 15 feet deep and 20 to 30 feet wide. Inavale soils make up about 65 percent of each mapped area, and Cass, Doger, Dunday, and Wann soils make up the rest. Inavale soils commonly have a surface layer of loamy fine sand, but in places the surface layer is fine sand or fine sandy loam.

The Cass soils are in low areas on the edges of the stream valley. Doger and Dunday soils are on mounds or slight undulations. Wann soils are along tributary drainageways that enter the stream valley.

Runoff is slow. These soils are subject to flooding in spring and after heavy rains during summer. Deposition of debris and sediment, scouring action, and streambank erosion are common during flooding. The meandering channels dissect the areas into small parcels that are not practical to farm.

All areas of this complex remain in native vegetation and are used for grazing. Native trees and shrubs along the channels in some areas provide cover for wildlife and protection for livestock. Capability unit VIw–1; Overflow range site.

Jerauld series

The Jerauld series consists of deep, nearly level, somewhat poorly drained, silty soils that have a clay-

pan subsoil. These soils are on terraces. They formed in alluvium. The native vegetation is mainly short and mid grasses.

In a representative profile the surface layer is gray silt loam about 3 inches thick. The subsoil is dark grayish brown clay loam about 7 inches thick. Nests of salt crystals are in the lower part. The underlying material to a depth of 42 inches is grayish brown and dark gray clay loam that contains nests of salt crystals. Light yellowish brown and light olive brown clay is at a depth of 42 inches.

Jerauld soils are low in fertility and moderately low in content of organic matter. Permeability is slow or very slow, and available water capacity is moderate.

Most areas of these soils remain in native grass and are used for grazing. A few areas are in cultivated crops.

Jerauld soils in Tripp County are mapped only in complex with Mosher soils.

Representative profile of Jerauld silt loam in an area of Mosher-Jerauld silt loams, in native grass, 250 feet east and 2,390 feet south of the northwest corner of sec. 29, T. 102 N., R. 78 W.:

A2—0 to 3 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak fine blocky structure parting to weak thin platy; soft, very friable; neutral; clear smooth boundary.

B2t—3 to 6 inches; dark grayish brown (10YR 4/2) heavy clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium columnar structure; extremely hard, very firm, sticky and plastic; gray coatings on tops and sides of columns; moderately alkaline; clear wavy boundary.

B3—6 to 10 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse blocky structure; very hard, very firm, sticky and plastic; few nests of salt crystals; moderately alkaline; abrupt wavy boundary.

C1sa—10 to 22 inches; grayish brown (2.5Y 5/2) heavy clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, sticky and plastic; few nests of salt crystals; strongly alkaline; clear wavy boundary.

C2sa—22 to 28 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, sticky and plastic; common segregations of lime and nests of salt crystals; slight effervescence; strongly alkaline; clear smooth boundary.

Absa—28 to 42 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; massive; very hard, very firm, sticky and plastic; many nests of salt crystals; slight effervescence; strongly alkaline; clear smooth boundary.

C3—42 to 60 inches; light yellowish brown (2.5Y 6/4) and light olive brown (2.5Y 5/4) clay, light olive brown (2.5Y 5/4) and olive brown (2.5Y 4/4) moist; massive; extremely hard, extremely firm, very sticky and very plastic; slight effervescence; moderately alkaline.

Some pedons have a dark grayish brown A1 horizon that is 1 to 2 inches thick. The A2 horizon is gray or light gray and is 1 to 3 inches thick. The B horizon is dark grayish brown or grayish brown in hue of 10YR or 2.5Y and is clay loam or clay. Reaction is moderately alkaline or strongly alkaline. The C horizon has hue of 10YR or 2.5Y and commonly is stratified with loam to clay. In places the lower part of the C horizon is gravelly and in places clayey shale is at a depth of 40 to 60 inches.

Jerauld soils in Tripp County formed in stratified alluvium, contain more sand and less clay, and have a thinner B2t horizon than is defined in the range for the series. These differences do not alter their usefulness or behavior.

Jerauld soils are mapped with or near Keya and Mosher soils and are similar to Hurley, Lute, and Wanblee soils. Jerauld soils are less clayey in the B horizon than Hurley soils. They are more clayey in the B horizon and contain more sodium than Keya soils. Jerauld soils are more clayey and have salts at a shallower depth than Lute soils, and they have a thinner A horizon than Mosher soils. They lack the siltstone C horizon of Wanblee soils.

Kadoka series

The Kadoka series consists of moderately deep, nearly level to strongly sloping, well drained, silty soils on uplands. These soils formed in material weathered from underlying siltstone. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is dark grayish brown silt loam about 5 inches thick. The subsoil is about 13 inches thick. It is dark grayish brown silty clay loam in the upper part, brown silty clay loam in the middle part, and pale brown loam in the lower part. The underlying material to a depth of 28 inches is light gray, calcareous loam. White, calcareous siltstone is at a depth of 28 inches.

Kadoka soils are medium in fertility and moderate in content of organic matter. Permeability is moderate, and available water capacity is low.

About half of the acreage is in cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Kadoka silt loam, 0 to 3 percent slopes, in native grass, 520 feet south and 900 feet west of the northeast corner of sec. 28, T. 96 N., R. 77 W.:

A1—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate medium granular; soft, very friable; neutral; clear smooth boundary.

B21t—5 to 9 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse prismatic structure parting to weak medium and fine subangular blocky; slightly hard, very friable,

slightly sticky and slightly plastic; neutral; clear smooth boundary.

B22t—9 to 14 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; hard, firm, slightly sticky and slightly plastic; neutral; clear smooth boundary.

B3—14 to 18 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, firm, neutral; abrupt wavy boundary.

Cca—18 to 28 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable; common fine fragments of siltstone; common medium segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

Cr—28 to 60 inches; white (10YR 8/2) siltstone bedrock, pale brown (10YR 6/3) moist; bedded; cemented but can be chipped readily with a spade; violent effervescence; moderately alkaline.

Siltstone bedrock is at a depth of 20 to 40 inches. Lime is at a depth of 16 to 25 inches. The A horizon is dark grayish brown or grayish brown and is 4 to 7 inches thick. The B2t horizon is dark grayish brown to brown and is heavy silt loam or silty clay loam. It is 8 to 12 inches thick. The B3 horizon is brown or pale brown loam or silty clay loam. Some pedons have a few fine fragments of siltstone in the B horizon. The C horizon is light gray or very pale brown loam or silt loam. Siltstone fragments make up 5 to 30 percent of the C horizon. The Cr horizon is white, light gray, or very pale brown siltstone or very fine grained sandstone. It fractures into plates and fragments ¼ inch to 3 inches thick.

Kadoka soils are mapped with or near Epping, Huggins, Keya, Shena, Wanblee, and Wortman soils. Kadoka soils are deeper to siltstone than Epping and Shena soils. They are less clayey in the B horizon than Huggins soils, and they have a thinner A horizon than Keya soils. Kadoka soils do not have columnar structure in the B horizon, and they contain less sodium than Wanblee and Wortman soils.

KaA—Kadoka silt loam, 0 to 3 percent slopes. This soil is nearly level to very gently sloping. Areas of this soil are irregular in shape and are 20 to more than 200 acres in size. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Huggins, Ree, and Wortman soils. Huggins soils are on slight rises. Ree soils are intermingled throughout. Wortman soils are in slightly concave, low areas. Gumbo or scabby spots and small wet spots are in some areas and are shown on the soil map by spot symbols.

Runoff is slow. This soil has only minor limitations for crops except for periodic shortages of rainfall. Conserving moisture is the main concern in management.

About half of the acreage is in cultivated crops, mainly alfalfa, corn, and small grain. Areas in native grass are used for grazing and hay. Capability unit IIc–2; Silty range site.

KbD—Kadoka-Epping silt loams, 6 to 12 percent slopes. This complex of moderately sloping to strongly sloping soils is on uplands. Areas are irregular in shape and are 50 to more than 200 acres in size. This complex is about 60 percent Kadoka soil, 25 percent Epping soil, and 15 percent other soils. The Kadoka soil is on the mid and lower parts of the landscape, and the Epping soil is on the tops and upper sides of convex ridges. The Kadoka soil has a thinner subsoil and are slightly shallower to siltstone than the soil described as representative of the Kadoka series.

Included with these soils in mapping are Huggins, Keya, and Shena soils. Huggins soils are intermingled with the Kadoka soils. Keya soils are in swales. Shena soils are on some of the ridges. Gumbo or scabby spots are in some mapped areas and are shown on the soil map by a spot symbol.

Runoff is medium to rapid. The hazard of water erosion is severe. Controlling water erosion is the main concern in management.

Most areas of this complex remain in native grass and are used for grazing. The shallow Epping soil is not suited to cultivation. Alfalfa and small grain are the main crops in cultivated areas. Kadoka part in capability unit IVe–1, Silty range site; Epping part in capability unit VIe–11, Shallow range site.

Keya series

The Keya series consists of deep, nearly level, moderately well drained, loamy soils in swales on uplands. These soils formed in alluvium washed in from adjacent uplands. The native vegetation is mainly mid and tall grasses.

In a representative profile the surface layer is dark grayish brown silt loam about 15 inches thick. The subsoil is clay loam about 29 inches thick; it is dark grayish brown in the upper part, grayish brown in the middle part, and brown in the lower part. The underlying material is dark grayish brown and brown clay loam.

Keya soils are high in fertility and in content of organic matter. Permeability is moderate, and available water capacity is high.

Most areas of these soils are used for cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Keya silt loam, in cultivation, 1,900 feet north and 165 feet east of the southwest corner of sec. 28, T. 102 N., R. 78 W.:

A1—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; cloddy and weak fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

A12—7 to 15 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak coarse subangular blocky structure parting to moderate fine granular; slightly hard, very friable; neutral; abrupt smooth boundary.

B21t—15 to 28 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and slightly plastic; neutral; clear smooth boundary.

B22t—28 to 36 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure parting to moderate medium blocky; hard, firm, slightly sticky and slightly plastic; neutral; gradual smooth boundary.

B3—36 to 44 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; neutral; gradual smooth boundary.

Ab—44 to 50 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; massive; hard, firm, slightly sticky and slightly plastic; neutral; clear smooth boundary.

C—50 to 60 inches; brown (10YR 5/3) light clay loam, dark grayish brown (10YR 4/2) moist; few faint mottles of reddish brown; massive; hard, firm, slightly sticky and slightly plastic; neutral.

Free carbonates commonly are at a depth of more than 60 inches but in places the C horizon is calcareous. The A horizon is dark grayish brown or grayish brown silt loam or loam. It is 14 to 20 inches thick. The B2t horizon commonly is clay loam, but in places it is loam. It is 12 to 24 inches thick. The B3 horizon is brown or grayish brown clay loam or loam. It is 3 to 8 inches thick. The C horizon is fine sandy loam to silty clay loam and in places is calcareous. Some pedons lack a buried A horizon.

Keya soils are near Canning, Jerauld, Kadoka, Mosher, Ree, and Rosebud soils and are similar to Onita and Vetal soils. They have a thicker A horizon than Canning, Kadoka, Ree, and Rosebud soils. Keya soils are less clayey in the B horizon than Jerauld, Mosher, and Onita soils, and they contain less sodium than Jerauld and Mosher soils. They contain more clay and less sand than Vetal soils.

Ke—Keya silt loam (0 to 2 percent slopes). Areas of this soil are long and narrow. They are 25 to 100 acres in size. Slopes are plane to concave.

Included with this soil in mapping are small areas of Kadoka and Ree soils on the edges of the areas as they merge into the adjacent uplands. Gumbo or scabby spots and small wet spots are in some mapped areas and are shown on the soil map by spot symbols.

Runoff is slow. This soil receives extra moisture in the form of runoff from adjacent soils. The additional moisture is beneficial in most years. Wetness delays planting only in years of above average precipitation. Conserving moisture is the main concern in management.

Most areas of this soil are in cultivated crops, but the use of this soil is determined by nearby soils. Alfalfa and small grain are the main crops. Areas in native grass are used for hay and grazing. Capability unit IIc–3; Overflow range site.

Kolls series

The Kolls series consists of deep, level, poorly drained, clayey soils in closed depressions. These soils formed in alluvium washed in from adjacent soils. The native vegetation is mainly mid grasses.

In a representative profile the surface layer is dark gray clay about 5 inches thick. The subsoil is gray, calcareous clay about 17 inches thick. The underlying material is gray, calcareous clay.

Kolls soils are medium in fertility and moderate in content of organic matter. Permeability is very slow, and available water capacity is moderate.

Nearly all areas of these soils remain in native grass and are used for grazing and hay.

Representative profile of Kolls clay, in native grass, 200 feet east and 1,320 feet south of the northwest corner of sec. 16, T. 100 N., R. 76 W.:

A11—0 to 3 inches; dark gray (10YR 4/1) clay, black (10YR 2/1) moist; moderate fine blocky structure parting to moderate medium granular; extremely hard, extremely firm, very sticky and very plastic; neutral; abrupt smooth boundary.

A12—3 to 5 inches; dark gray (N 4/0) clay, very dark gray (10YR 3/1) moist; moderate medium blocky structure parting to weak medium granular; extremely hard, extremely firm, very sticky and very plastic; slight effervescence; mildly alkaline; clear smooth boundary.

Bg—5 to 22 inches; gray (10YR 5/1) clay, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to moderate medium and coarse blocky; extremely hard, extremely firm, very sticky and very plastic; slight effervescence; mildly alkaline; gradual wavy boundary.

C1g—22 to 30 inches; gray (5Y 5/1) clay, very dark gray (5Y 3/1) moist; massive; extremely hard, extremely firm, very sticky and very plastic; slight effervescence; mildly alkaline; gradual wavy boundary.

C2g—30 to 60 inches; gray (5Y 5/1) clay, very dark grayish brown (2.5Y 3/2) moist; massive; extremely hard, extremely firm, very sticky and very plastic; few fine segregations of lime; slight effervescence; mildly alkaline.

Free carbonates are at or near the surface. The A and B horizons range in hue from neutral to 10YR. The A horizon is dark gray or gray and is 3 to 5 inches thick. The B horizon is gray or dark gray and is 16 to 24 inches thick. The C horizon is gray to light olive gray in hue of 2.5Y, 5Y, or neutral. Some pedons have fine segregations of lime and nests of gypsum crystals in the C horizon.

Kolls soils are mapped near Carter, Lakoma, Millboro, Promise, and Witten soils. They are more poorly

drained than those soils and are more clayey in the B horizon than Lakoma, Millboro, and Witten soils.

Ko—Kolls clay (0 to 1 percent slopes). This soil is in closed depressions. Areas are circular to oval and are mostly 5 to 150 acres in size.

Included with this soil in mapping are small areas of Carter and Hurley soils on the rims of the depressions.

Runoff collects in these areas and ponds until the water evaporates. This soil takes in water slowly and releases moisture slowly to plants. Tilth is poor and cracks form when the soil dries.

Nearly all areas of this soil are in native grass and are used for hay or grazing. Capability unit Vw–4; Closed Depression range site.

Lakoma series

The Lakoma series consists of moderately deep, moderately sloping to steep, well drained, clayey soils on uplands. These soils formed in material weathered from the underlying shale. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is dark grayish brown silty clay about 5 inches thick. The subsoil is grayish brown clay about 17 inches thick. The underlying material to a depth of 28 inches is light brownish gray shaly clay. Light brownish gray soft shale is at a depth of 28 inches. The entire profile is calcareous.

Lakoma soils are low in fertility and moderately low in content of organic matter. Permeability is slow, and available water capacity is very low.

Some of the moderately sloping Lakoma soils are used for cultivated crops, but most of the strongly sloping to steep soils remain in native grass and are used for grazing.

Representative profile of Lakoma silty clay in an area of Lakoma-Millboro silty clays, 5 to 9 percent slopes, in a cultivated field, 225 feet west and 75 feet north of the southeast corner of sec. 35 T. 101 N., R. 76 W.:

Ap—0 to 5 inches; dark grayish brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) crushing to dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; slightly hard, firm, very sticky and very plastic; strong effervescence; moderately alkaline; clear smooth boundary.

B2—5 to 12 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) crushing to grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; hard, firm but crumbly, very sticky and very plastic; strong effervescence; moderately alkaline; clear smooth boundary.

B3—12 to 22 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) crushing to grayish brown (2.5Y 5/2) moist; weak medium blocky structure parting to weak fine and medium subangular blocky; hard, firm, very sticky and very plastic; few medium segregations of lime; strong effervescence; moderately alkaline; clear smooth boundary.

C—22 to 28 inches; light brownish gray (2.5Y 6/2) shaly clay, grayish brown (2.5Y 5/2) moist; massive; hard, firm, very sticky and very plastic; 30 to 40 percent by volume partially weathered shale fragments; few medium segregations of lime; strong effervescence; moderately alkaline; clear smooth boundary.

Cr—28 to 60 inches; light brownish gray (2.5Y 6/2) bedded shale, grayish brown (2.5Y 5/2) moist; platy bedrock structure; plates are 1/8- to 1/2-inch thick; common nests of gypsum crystals in upper part; violent effervescence in seams only; moderately alkaline.

Soft shale is at a depth of 20 to 40 inches. The A and B horizons have hue of 2.5Y or 10YR, and they commonly are one higher in value when the soil is crushed. The A horizon is dark grayish brown or grayish brown and is silty clay or clay. It is 4 to 6 inches thick. The B2 horizon is dark grayish brown or grayish brown and is clay or silty clay. It is 6 to 8 inches thick. The B3 horizon is grayish brown or light brownish gray and is 4 to 12 inches thick. The C horizon is light brownish gray to pale olive and is 50 percent chips and fragments of soft shale. The shale in the Cr horizon is light olive brown to light gray. Nests of gypsum crystals commonly are in the C or Cr horizon, but some pedons lack gypsum crystals.

Lakoma soils are mapped with or near Boro, Millboro, Okaton, Promise, and Witten soils and are similar to Opal soils. They are shallower to shale than Boro, Millboro, Promise, and Witten soils, and are deeper to shale than Okaton soils. Lakoma soils are less clayey and are lighter colored when moist than Opal soils.

LkC—Lakoma-Millboro silty clays, 5 to 9 percent slopes. Areas of this complex are irregular in shape and are 75 to more than 200 acres in size. This complex is about 50 percent Lakoma soil, 30 percent Millboro soil, and 20 percent other soils. These soils are moderately sloping. The Lakoma soil is on convex ridges. The Millboro soil is on the lower part of the landscape. The Lakoma soil has the profile described as representative of the Lakoma series. The Millboro soil has a thinner surface layer and a thinner subsoil than the soil described as representative of the Millboro series.

Included with these soils in mapping are Boro and Witten soils. Boro soils are the most extensive and are near Lakoma soils. Witten soils are in swales. Small areas that have a gravelly surface layer and gumbo or scabby spots are in some mapped areas and are shown on the soil map by spot symbols.

Runoff is medium. Controlling water erosion and soil blowing is the main concern in management.

Most areas of this complex are in cultivated crops, mainly sorghum and winter wheat. Areas in native grass are used for grazing and hay. Capability unit IVe–4; Clayey range site.

LoD—Lakoma-Okaton silty clays, 9 to 15 percent slopes. This complex is on uplands. Areas are irregular

in shape and are 100 to more than 400 acres in size. They generally are made up of a series of ridges and entrenched drainageways. Large stones are scattered on the surface in some areas. This complex is about 60 percent Lakoma soil, 25 percent Okaton soil, and 15 percent other soils. The Lakoma soil is in the mid and lower parts of the landscape. The Okaton soil is on tops and upper sides of convex ridges. The Lakoma soil is slightly shallower to shale than the soil described as representative of the Lakoma series.

Included with these soils in mapping are small areas of Boro and Millboro soils in the lower part of the landscape and on some of the wider ridgetops. Small gravelly areas are on some of the ridges and are shown on the soil map by a spot symbol.

Runoff is rapid. The hazard of erosion is severe if the surface layer is disturbed. Controlling water erosion is the main concern in management.

Almost all areas of this complex remain in native grass and are used for grazing. Capability unit VIe–4; Lakoma part in Clayey range site, Okaton part in Shallow range site.

Lowry series

The Lowry series consists of deep, nearly level to gently sloping, well drained, silty soils on uplands. These soils formed in silty loess. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil, about 18 inches thick, is grayish brown silt loam that is calcareous in the lower part. The underlying material to a depth of 55 inches is light brownish gray, calcareous silt loam and loam. Light brownish gray, calcareous loamy fine sand is at a depth of 55 inches.

Lowry soils are medium in fertility and moderate in content of organic matter. Permeability is moderate, and available water capacity is high.

About half of the acreage is farmed. Areas in native grass are used for grazing and hay.

Representative profile of Lowry silt loam, 0 to 4 percent slopes, in native grass, 100 feet north and 800 feet west of where the road enters the flat from the east in sec. 36, T. 103 N., R. 78 W.:

A1—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure parting to weak medium and fine granular; soft, very friable; mildly alkaline; clear smooth boundary.

B2—10 to 19 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; mildly alkaline; abrupt wavy boundary.

B3—19 to 28 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable; slight effervescence; moderately alkaline; clear smooth boundary.

C1—28 to 38 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure; slightly hard, friable; slight effervescence; moderately alkaline; clear smooth boundary.

C2—38 to 55 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

IIC3—55 to 60 inches; light brownish gray (2.5Y 6/2) loamy fine sand, grayish brown (2.5Y 5/2) moist; single grained; loose; slight effervescence; moderately alkaline.

Free carbonates are at a depth of 10 to 20 inches. The A horizon is dark grayish brown or grayish brown and is 5 to 10 inches thick. The B2 horizon is grayish brown or dark grayish brown and is 4 to 10 inches thick. The C horizon is light brownish gray or pale brown and is loam or silt loam to a depth of 40 to 60 inches or more.

Lowry soils are near Mosher, Ree, Reliance, and Westover soils. They contain less clay and less sodium in the B horizon than Mosher soils. Lowry soils contain less clay in the B horizon than Ree and Reliance soils. They have a thicker A horizon and are more silty than Westover soils.

LwA—Lowry silt loam, 0 to 4 percent slopes. This nearly level to gently sloping soil is on uplands. Areas are irregular in shape and are 40 to more than 200 acres in size. Slopes commonly are long and smooth.

Included with this soil in mapping are small areas of Reliance soils in swales and low areas. Small wet spots and gumbo or scabby spots are in some mapped areas and are shown on the soil map by spot symbols.

Runoff is medium. This soil is easy to work, but it is subject to soil blowing. Controlling soil blowing is the main concern in management.

About half of the acreage is in cultivated crops, mainly alfalfa and small grain. Areas in native grass are used for grazing and hay. Capability unit IIe–1; Silty range site.

Lute series

The Lute series consists of deep, nearly level, somewhat poorly drained, loamy soils that have a claypan subsoil. These soils are in broad upland basins. They formed in sandy material. The native vegetation is mainly a mixture of tall, mid, and short grasses.

In a representative profile the surface layer is gray fine sandy loam about 3 inches thick. The subsoil is about 15 inches thick. It is grayish brown and light brownish gray, calcareous sandy clay loam in the upper part and pale brown, calcareous fine sandy loam in the lower part. It is very strongly alkaline. The underlying material is light gray and pale brown, calcareous very fine sandy loam and loamy sand. It is stratified with thin layers of silt and clay.

Lute soils are low in fertility and moderately low in content of organic matter. Permeability is slow or very

slow, and available water capacity is low or moderate. Depth to the water table ranges from 1 to 5 feet.

Most areas of these soils remain in native grass and are used for grazing.

Lute soils in Tripp County are mapped only in complex with Whitelake soils.

Representative profile of Lute fine sandy loam in an area of Whitelake-Lute fine sandy loams, in native grass, 210 feet east and 1,425 feet north of the southwest corner of sec. 16, T. 97 N., R. 78 W.:

A2—0 to 3 inches; gray (10YR 5/1) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

B21t—3 to 6 inches; grayish brown (10YR 5/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse columnar structure parting to weak medium blocky; extremely hard, firm, sticky and plastic; gray (10YR 6/1) coats on tops of columns; few fine and medium segregations of lime; strong effervescence; very strongly alkaline; clear smooth boundary.

B22t—6 to 10 inches; light brownish gray (10YR 6/2) sandy clay loam, brown (10YR 5/3) moist; common medium distinct mottles of dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4) moist; weak coarse blocky structure parting to moderate medium blocky; very hard, firm, sticky and plastic; few fine segregations of lime; strong effervescence; very strongly alkaline; gradual smooth boundary.

B3—10 to 18 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; common fine faint mottles of dark brown (10YR 4/3) moist; weak coarse blocky structure; hard, friable; few fine segregations of lime; strong effervescence; very strongly alkaline; gradual smooth boundary.

C1—18 to 25 inches; light gray (10YR 7/2) very fine sandy loam stratified with thin lenses of silt and clay, grayish brown (10YR 5/2) moist; common medium faint mottles of brown (10YR 5/3) when moist; massive; hard, very friable; strong effervescence; very strongly alkaline; gradual wavy boundary.

C2—25 to 43 inches; pale brown (10YR 6/3) and light gray (10YR 7/2) loamy sand stratified with thin lenses of silt and clay, yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) moist; massive; hard, very friable; common fine segregations of lime; strong effervescence; very strongly alkaline; abrupt wavy boundary.

C3—43 to 60 inches; light gray (10YR 7/2) very fine sandy loam stratified with thin lenses of silt and clay, grayish brown (10YR 5/2) moist; massive; hard, very friable; strong effervescence; strongly alkaline; abrupt wavy boundary.

Reaction below the A2 horizon is very strongly alkaline or strongly alkaline. The A2 horizon is gray to light brownish gray and is fine sandy loam or loamy fine sand. It is neutral to moderately alkaline and is ½ to 5 inches thick. The B2t horizon is grayish brown or dark grayish brown in the upper part and is grayish brown to light yellowish brown in the lower part. Hue is 10YR or 2.5Y. The B2t horizon commonly is sandy clay loam, but in places it is heavy fine sandy loam. It is 5 to 10 inches thick. The B3 and C horizons are grayish brown to very pale brown in hue of 10YR or 2.5Y. Some pedons have a buried A horizon at a depth of 40 to 60 inches.

Lute soils are mapped with or near Anselmo, Doger, Elsmere, Inavale, Wanblee, Whitelake, and Wortman soils. They have columnar structure in the B horizon and contain more sodium than Anselmo, Doger, Elsmere, and Inavale soils. Lute soils are more poorly drained than Anselmo, Doger, Inavale, Wanblee, Whitelake, and Worman soils. They are more sandy in the B horizon than Wanblee and Wortman soils, and they have a thinner A horizon than Whitelake soils.

Manter series

The Manter series consists of deep, nearly level to moderately steep, well drained, loamy soils on uplands. These soils formed in eolian material. The native vegetation is mainly mid and tall grasses.

In a representative profile the surface layer is dark grayish brown fine sandy loam about 7 inches thick. The subsoil is fine sandy loam about 29 inches thick; it is grayish brown in the upper part, brown in the middle part, and pale brown in the lower part. The underlying material is pale brown fine sandy loam.

Manter soils are medium in fertility and moderate in content of organic matter. Permeability is moderately rapid, and available water capacity is moderate.

About half of the acreage is in cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Manter fine sandy loam, 3 to 9 percent slopes, in cultivation, 2,200 feet east and 695 feet north of the southwest corner of sec. 29, T. 97 N., R. 77 W.:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; cloddy and weak thick platy structure parting to weak medium granular; soft, very friable; neutral; abrupt smooth boundary.

A12—5 to 7 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky and weak medium granular structure; soft, very friable; neutral; clear smooth boundary.

B21t—7 to 15 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; coats of dark grayish brown on faces of some peds;

slightly hard, friable; neutral; gradual wavy boundary.

B22t—15 to 27 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak medium and coarse prismatic structure parting to moderate medium and fine subangular blocky and blocky; hard, firm; few coats of dark grayish brown on faces of peds; neutral; gradual wavy boundary.

B3—27 to 36 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; hard, friable; mildly alkaline; gradual wavy boundary.

C—36 to 60 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable; mildly alkaline.

The A and B2t horizons are neutral or mildly alkaline. The A horizon is dark grayish brown or grayish brown and in places is loamy fine sand. It is 6 to 10 inches thick. The B2t horizon is dark grayish brown to brown and is 15 to 25 inches thick. The B3 horizon is pale brown or light brownish gray. The C horizon is light brownish gray to very pale brown and is fine sandy loam or loamy fine sand. In places fine grained sandstone or siltstone is at a depth of 40 to 60 inches.

Manter soils in Tripp County lack the free carbonates that are defined in the range for the series. This difference does not alter their usefulness and behavior.

Manter soils are mapped with Anselmo soils and are near Holt, Ree, and Vetal soils. They are more clayey in the B horizon than Anselmo soils, and they are deeper to sandstone than Holt soils. Manter soils are less clayey in the B horizon than Ree soils, and they have a thinner A horizon than Vetal soils.

MaA—Manter fine sandy loam, 0 to 3 percent slopes. This soil is nearly level to gently undulating. Areas are irregular in shape and are 50 to more than 200 acres in size. This soil has a thicker subsoil than the soil described as representative of the series. Also, in places the surface layer is loamy fine sand.

Included with this soil in mapping are small areas of Anselmo, Chappell, and Vetal soils. Anselmo soils are intermingled with Manter soils. Chappell soils are on some of the undulations or low ridges. Vetal soils are in swales. Small wet spots and gumbo or scabby spots are in some mapped areas and are shown on the soil map by spot symbols.

Runoff is slow, and most of the rainfall enters the soil. This soil is easy to work, but it is subject to soil blowing. Controlling soil blowing is the main concern of management.

Most areas of this soil are in cultivated crops, mainly alfalfa, corn, and oats. In places sorghum also is grown. Areas in native grass are used for grazing and hay. Capability unit IIIe–7; Sandy range site.

MaB—Manter fine sandy loam, 3 to 9 percent slopes. This soil is gently sloping to moderately sloping. Areas are irregular in shape and are 40 to more than 200 acres in size. This soil has the profile described as representative of the series, but in places the surface layer is loamy fine sand.

Included with this soil in mapping are small areas of Anselmo, Holt, and Vetal soils. Anselmo soils are on the lower part of the landscape. Holt soils are on some of the ridges. Vetal soils are in swales. Sand blowouts, small gravelly areas, and small wet spots are in some mapped areas and are shown on the soil map by spot symbols.

Runoff is slow to medium. This soil is easy to work, but it is subject to soil blowing and water erosion. Controlling soil blowing and water erosion is the main concern in management.

About half of the acreage is in cultivated crops, mainly alfalfa, corn, and oats. Areas in native grass are used for grazing and hay. Capability unit IIIe–8; Sandy range site.

MfE—Manter-Anselmo fine sandy loams, 15 to 30 percent slopes. Areas of this complex consist of entrenched drainageways and drainage divides that extend from high tablelands to lower and smoother landscapes. The soils are moderately steep to steep. Areas are mostly irregular in shape but some are long and narrow. They are 100 to more than 200 acres in size. This complex is about 50 percent Manter soil, 30 percent Anselmo soil, and 20 percent other soils. The Manter soil is on drainage divides, and the Anselmo soil is on the sides of drainageways. These soils have a thinner subsoil than the soils described as representative of their respective series.

Included with these soils in mapping are small areas of Boyd, Dix, Okaton, and Tassel soils. Boyd and Okaton soils are on the foot slopes in some areas. Dix soils are on the shoulders of some of the drainageways. Tassel soils are on some of the high ridges.

Runoff is slow to medium. These soils are subject to soil blowing and water erosion if the plant cover is removed. Seeps and springs are in the bottoms of some of the drainageways.

All areas of this complex remain in native grass and are used for grazing. Native trees and shrubs are along some of the drainageways and provide food and cover for wildlife. Capability unit VIe–6; Sandy range site.

Marsh

Mh—Marsh (0 to 1 percent slopes). This mapping unit is in flat, closed depressions that range from 5 to 40 acres in size. These nearly level areas are wet during the growing season and commonly are under water during some part of the growing season in most years. Small areas of open water commonly are in the center of the more deeply entrenched depressions. Some of the smaller areas are dry at the surface late in summer or in fall.

Most areas are too wet for grazable plants. The native vegetation consists mainly of rushes, cattails, and sedges. These areas are better suited to wildlife habitat than to most other uses. Capability unit VIIIw–1; not placed in a range site.

Millboro series

The Millboro series consists of deep, nearly level to moderately sloping, well drained, clayey soils on uplands. These soils formed in clayey material weathered from shale. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is dark grayish brown silty clay about 7 inches thick. The subsoil is about 29 inches thick. It is dark grayish brown clay in the upper part; grayish brown, calcareous clay in the middle part; and grayish brown, calcareous silty clay in the lower part. Spots and streaks of soft lime are in the lower part and extend into the underlying material. The underlying material is calcareous silty clay that is grayish brown in the upper part and light yellowish brown in the lower part.

Millboro soils are medium in fertility and moderate in content of organic matter. Permeability is slow, and available water capacity is moderate.

More than half of the acreage is in cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Millboro silty clay, 3 to 6 percent slopes, in cultivation, 240 feet north and 2,555 feet west of the southeast corner of sec. 25, T. 100 N., R. 78 W.:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silty clay, very dark brown (10YR 2/2) moist; cloddy and weak coarse and medium subangular blocky structure; hard, firm but crumbly, sticky and plastic; neutral; abrupt smooth boundary.

A12—5 to 7 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; weak coarse and medium subangular blocky structure; very hard, firm but crumbly, sticky and plastic; mildly alkaline; clear smooth boundary.

B21t—7 to 13 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse prismatic structure parting to moderate fine and very fine subangular blocky; very hard, firm but crumbly, sticky and plastic; neutral; clear smooth boundary.

B22t—13 to 19 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate fine and very fine subangular blocky; very hard, firm but crumbly, sticky and plastic; many tongues ¼ to 1 inch wide of dark grayish brown (10YR 4/2) material, very dark grayish brown (10YR 3/2) moist; strong effervescence; mildly alkaline; clear smooth boundary.

B31—19 to 28 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate medium blocky; extremely hard, very firm, very sticky and very plastic; many tongues ¼ to 1 inch wide of dark grayish brown (10YR 4/2) material, very dark grayish brown (10YR 3/2) moist; many pressure faces and common slickensides; common medium segregations of lime; strong effervescence; moderately alkaline; clear smooth boundary.

B32ca—28 to 36 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse blocky structure; extremely hard, very firm, very sticky and very plastic; many tongues ¼ to 1 inch wide of dark grayish brown (10YR 4/2) material, very dark grayish brown (10YR 3/2) moist; many pressure faces and common slickensides; many fine and medium segregations of lime; strong effervescence; moderately alkaline; clear wavy boundary.

C1—36 to 43 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, very sticky and very plastic; few tongues ¼ inch wide of dark grayish brown (10YR 4/2) material, very dark grayish brown (10YR 3/2) moist; few fine segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C2sa—43 to 56 inches; light yellowish brown (2.5Y 6/3) silty clay, olive brown (2.5Y 4/4) moist; massive; few tongues ¼ inch wide of dark grayish brown (10YR 4/2) material, very dark grayish brown (10YR 3/2) moist; hard, firm, sticky and plastic; many fine segregations of salt and lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C3—56 to 60 inches; light yellowish brown (2.5Y 6/3) silty clay, olive brown (2.5Y 4/4) moist; massive; few tongues ¼ inch wide of dark grayish brown (10YR 4/2) material, very dark grayish brown (10YR 3/2) moist; hard, firm, sticky and plastic; strong effervescence; moderately alkaline.

Free carbonates are commonly at a depth of 7 to 20 inches, but in some cultivated areas carbonates are at or near the surface. Cracks, ¼ to 2 inches wide and several feet long, extend into the C horizon when the soil is dry. The A horizon is very dark gray to grayish brown in hue of 10YR or 2.5Y and commonly is silty clay, but in places it is silty clay loam or clay. It is 5 to 8 inches thick. The B2t horizon is dark gray to light olive brown and is clay or silty clay. It is 8 to 14 inches thick. The B3 horizon is grayish brown to light yellowish brown and is silty clay or clay. Segregations of lime in the lower part are common or many. The B3 and C horizons are moderately alkaline or mildly alkaline. The C horizon is grayish brown to pale yellow in hue of 2.5Y or 5Y and is silty clay or clay. In places chips and fragments of shale are in the C horizon and in places bedded shale is at a depth of 40 to 60 inches.

Millboro soils are mapped with Boro and Lakoma soils and are near Boyd, Carter, Okaton, Promise, Reliance, and Witten soils. They have a thicker A horizon than Boro soils. They are deeper to shale then Boyd, Lakoma, and Okaton soils. Millboro soils do not have columnar structure in the B horizon and are less clayey in the B horizon than Carter soils. They

are also less clayey in the B horizon than Promise soils, and they have a thinner A horizon than Witten soils.

MoA—Millboro silty clay, 0 to 3 percent slopes. Areas of this soil are irregular in shape and are 50 to more than 300 acres in size. Slopes are long and uniform. This soil has a thicker surface layer and a thicker subsoil than the soil described as representative of the series.

Included with this soil in mapping are small areas of Carter and Witten soils. Carter soils are in slightly concave, low areas. Witten soils are in swales. Small wet spots and gumbo or scabby spots are in some mapped areas and are shown on the soil map by spot symbols.

Runoff is slow to medium. This soil takes in water slowly and loses tilth if farmed when wet. It also is subject to soil blowing. Improving water intake, maintaining good tilth, and controlling soil blowing are the main concerns in management.

Most areas of this soil are in cultivated crops, mainly alfalfa, oats, sorghum, and winter wheat. Areas in native grass are used for grazing and hay. Capability unit IIIs–3; Clayey range site.

MoB—Millboro silty clay, 3 to 6 percent slopes. Areas of this soil are irregular in shape and are 50 to more than 300 acres in size. Slopes generally are long and smooth and are plane to convex. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Boro, Carter, and Witten soils. Boro soils are on convex ridges. Carter soils are on foot slopes and in low areas. Witten soils are in swales. Small wet spots, gumbo or scabby spots, and small gravelly areas on some of the ridges are shown on the soil map by spot symbols.

Runoff is medium. The hazard of water erosion and soil blowing is moderate to severe. This soil takes in water slowly and loses tilth if farmed when wet. Controlling water erosion and soil blowing, maintaining good tilth, and improving water intake are the main concerns in management.

Most areas of this soil are in cultivated crops, mainly alfalfa, oats, sorghum, and winter wheat. Areas in native grass are used for grazing and hay. Capability unit IIIe–4; Clayey range site.

MoC—Millboro silty clay, 6 to 9 percent slopes. Areas of this soil are irregular in shape and are 60 to more than 300 acres in size. Slopes are long and convex. This soil has a thinner surface layer and a thinner subsoil than the soil described as representative of the series.

Included with this soil in mapping are small areas of Boro, Lakoma, Reliance, and Witten soils. Boro and Lakoma soils are on the tops and upper sides of ridges. Reliance soils are on some of the higher ridges. Witten soils are in swales. Small gravelly areas on some of the higher ridges, small wet spots, and gumbo or scabby spots are in some areas and are shown on the soil map by spot symbols.

Runoff is medium. This soil is subject to water erosion and soil blowing. It takes in water slowly and loses tilth if farmed when wet. Controlling water erosion and soil blowing, maintaining tilth, and improving water intake are the main concerns in management.

Most areas of this soil are in cultivated crops, mainly oats, sorghum, and winter wheat. Areas in native grass are used for grazing. Capability unit IVe–4; Clayey range site.

Mosher series

The Mosher series consists of deep, nearly level, moderately well drained, silty soils on terraces. These soils have a claypan subsoil and formed in alluvium. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is dark grayish brown silt loam about 6 inches thick. The subsurface layer, about 2 inches thick, is grayish brown loam. The subsoil is about 14 inches thick; it is dark grayish brown and grayish brown clay in the upper part and grayish brown clay loam in the lower part. The underlying material to a depth of 38 inches is grayish brown, calcareous sandy clay loam. A layer of gray clay loam is at a depth of 38 inches and pale olive clay is at a depth of 50 inches. The lower part of the subsoil and all of the underlying material are strongly alkaline and contain nests of salt crystals.

Mosher soils are medium in fertility and moderate in content of organic matter. Permeability is very slow, and available water capacity is moderate.

Most areas of these soils remain in native grass and are used for grazing.

Representative profile of Mosher silt loam in an area of Mosher-Jerauld silt loams, in native grass, 2,560 feet south and 75 feet east of the northwest corner of sec. 29, T. 102 N., R. 78 W.:

A1—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure parting to weak medium and thin platy; soft, very friable; neutral; clear smooth boundary.

A2—6 to 8 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to weak thin platy; soft, very friable; neutral; abrupt smooth boundary.

B21t—8 to 12 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong medium and coarse columnar structure; extremely hard, extremely firm, sticky and plastic; moderately alkaline; clear smooth boundary.

B22t—12 to 16 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium blocky; extremely hard, extremely firm, sticky and plastic; moderately alkaline; abrupt wavy boundary.

B3sa—16 to 22 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium blocky structure; very hard, very firm, sticky and plastic; common nests of salt crystals; strongly alkaline; gradual wavy boundary.

C1sa—22 to 38 inches, grayish brown (2.5Y 5/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, slightly sticky and slightly plastic; many nests of salt crystals; slight effervescence; strongly alkaline; diffuse wavy boundary.

Ab—38 to 50 inches, gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; massive; very hard, very firm, slightly sticky and slightly plastic; many nests of salt crystals; slight effervescence; strongly alkaline; abrupt wavy boundary.

IIC2sa—50 to 60 inches, pale olive (5Y 6/4) clay, olive brown (2.5Y 4/4) moist; massive; very hard, very firm, very sticky and very plastic; many nests of salt crystals; slight effervescence; strongly alkaline.

The A1 horizon is dark grayish brown or grayish brown and is silt loam or loam. It is 4 to 8 inches thick. The A2 horizon is grayish brown or gray and in places is silt loam. It is 2 to 4 inches thick. The B2t horizon is dark gray to grayish brown in hue of 10YR or 2.5Y and is clay or clay loam. In places the upper part is neutral or mildly alkaline. It is 7 to 16 inches thick. The B3 and C horizons are loam to clay and commonly are stratified. In places the lower part of the C horizon is gravelly. Nests of salt crystals are few to many in the B3 and C horizons. Some pedons lack a buried A horizon.

Mosher soils are mapped with or near Canning, Jerauld, Keya, Manter, and Ree soils and are similar to Whitelake soils. They contain more clay and more sodium in the B horizon than Canning, Keya, Manter, and Ree soils. Mosher soils have a thicker A horizon and have accumulations of salts deeper in the profile then Jerauld soils. They have a thinner A horizon and are more clayey in the B horizon than Whitelake soils.

Mr—Mosher silt loam (0 to 2 percent slopes). This nearly level soil is on terraces. Areas are irregular in shape and are 20 to 100 acres in size. In places the surface layer is uneven because of small mounds that rise a few inches above the low spots. In places the subsoil and underlying material contain more silt and less sand than the soil described as representative of the series.

Included with this soil in mapping are small areas of Jerauld, Keya, Onita, Ree, and Reliance soils. Jerauld soils are in small, low spots. Keya and Onita soils are in swales. Ree and Reliance soils are on some of the slight rises. Small wet spots are in some areas and are shown on the soil map by a spot symbol.

Runoff is slow. This soil has poor tilth, and the claypan subsoil takes in water slowly and limits the development of plant roots. This soil is droughty late in summer. Maintaining tilth, improving water intake, and conserving moisture are the main concerns in management.

Most areas of this soil remain in native grass and are used for grazing. Alfalfa and winter wheat are the main cultivated crops. Capability unit IVs–2; Claypan range site.

Ms—Mosher-Jerauld silt loams (0 to 2 percent slopes). Areas of this complex are irregular in shape and are 20 to more than 200 acres in size. This complex is about 60 percent Mosher soil, 30 percent Jerauld soil, and 10 percent other soils. The surface layer commonly is uneven because of many small mounds that rise several inches above the intervening low spots. The Mosher soil is on the mounds, and the Jerauld soil is in the low spots. Both soils have the profiles described as representative of their respective series.

Included with these soils in mapping are Keya and Ree soils. Keya soils are in swales. Ree soils are in the better drained and higher parts of the landscape.

Runoff is slow, and water commonly ponds in the low spots. These soils have poor tilth and are difficult to work. The claypan subsoil takes in water slowly and releases moisture slowly to plants. The Jerauld soil is not suited to cultivation.

Most areas of this complex remain in native grass and are used for grazing. Alfalfa and winter wheat are the main cultivated crops. Mosher part in capability unit IVs–2, Claypan range site; Jerauld part in capability unit VIs–1, Thin Claypan range site.

Munjor series

The Munjor series consists of deep, nearly level, well drained, loamy soils on bottom lands. These soils formed in sandy alluvium. The native vegetation is mainly mid and tall grasses.

In a representative profile the surface layer is light brownish gray fine sandy loam about 6 inches thick. The next layer, about 3 inches thick, is light brownish gray and pale brown medium sand. Below this is very fine sandy loam and fine sandy loam. The entire profile is calcareous.

Munjor soils are low in fertility and in content of organic matter. Permeability is moderately rapid, and available water capacity is moderate or high. Some areas are subject to stream flooding.

About half of the acreage is in cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Munjor fine sandy loam, in native grass, 1,000 feet east and 2,300 feet north of the southwest corner of sec. 26, T. 103 N., R. 76 W.:

A1—0 to 6 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

C1—6 to 9 inches; light brownish gray (10YR 6/2) and pale brown (10YR 6/3) medium sand, grayish brown (10YR 5/2) moist; single grained; loose; slight effervescence; moderately alkaline; abrupt smooth boundary.

C2—9 to 13 inches; pale brown (10YR 6/3) very fine sandy loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

C3—13 to 42 inches; pale brown (10YR 6/3) fine sandy loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

C4—42 to 60 inches; pale brown (10YR 6/3) very

fine sandy loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; strong effervescence; moderately alkaline.

The A horizon commonly is light brownish gray or grayish brown but in places the upper 2 or 3 inches is dark grayish brown. It is 4 to 8 inches thick. The C horizon is grayish brown to pale brown and averages fine sandy loam but commonly is stratified with layers of medium sand to very fine sandy loam.

Munjor soils are near Bankard and Haverson soils and are similar to Cass soils. They are less sandy than Bankard soils and have a thinner and lighter colored A horizon than Cass soils. Munjor soils are less clayey and more sandy than Haverson soils.

Mu—Munjor fine sandy loam (0 to 2 percent slopes). This soil is on bottom lands of the White River. Areas are 20 to more than 200 acres in size. Slopes are nearly level and in some areas are broken by shallow swales that serve as flood routes when the river is in flood stage.

Included with this soil in mapping are small areas of Bankard and Haverson soils. Bankard soils are on slight undulations. Haverson soils are in swales and low areas.

Runoff is slow, and most of the rainfall enters the soil. This soil is easy to work, but it is subject to soil blowing. It is low in fertility. Some areas are subject to flooding, but flood damage seldom is serious. Controlling soil blowing and maintaining fertility and content of organic matter are the main concerns in management.

About half of the acreage is in cultivated crops, mainly alfalfa, oats, and sorghum. Areas in native grass are used for grazing or hay. Native trees are in some areas and provide wildlife habitat and winter protection for livestock. Capability unit IIIe-7; Overflow range site.

Murdo series

The Murdo series consists of moderately sloping to steep, well drained, loamy soils that are shallow over gravelly sand. These soils are on high terraces and terrace escarpments. They formed in alluvium. The native vegetation is mainly short and mid grasses.

In a representative profile the surface layer is dark grayish brown loam about 2 inches thick. The subsoil, about 10 inches thick, is dark brown and brown clay loam. The underlying material to a depth of 18 inches is light brownish gray and very pale brown, calcareous gravelly loam. Light brownish gray and very pale brown, calcareous gravelly sand is at a depth of 18 inches.

Murdo soils are medium in fertility and moderate in content of organic matter. Permeability is moderate in the subsoil and rapid in the underlying gravelly sand. Available water capacity is low.

Nearly all areas of these soils remain in native grass and are used for grazing.

Murdo soils in Tripp County are mapped only in complex with Canning and Schamber soils.

Representative profile of Murdo loam in an area of Schamber-Murdo complex, 15 to 40 percent slopes, in native grass, 820 feet north and 1,560 feet west of the southeast corner of sec. 3, T. 102 N., R. 76 W.:

A1—0 to 2 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, friable; about 10 percent gravel; neutral; clear smooth boundary.

B21t—2 to 8 inches; dark brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky; about 5 percent gravel; neutral; clear wavy boundary.

B22t—8 to 12 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky; about 5 percent gravel; neutral; abrupt wavy boundary.

IIC1ca—12 to 18 inches; light brownish gray (10YR 6/2) and very pale brown (10YR 7/3) gravelly loam, brown (10YR 5/3) moist; massive; loose; thick lime crusts on undersides of gravel; strong effervescence; mildly alkaline; gradual wavy boundary.

IIC2—18 to 60 inches; light brownish gray (10YR 6/2) and pale brown (10YR 6/3) gravelly sand, brown (10YR 5/3) moist; single grained; loose; strong effervescence; mildly alkaline.

Gravelly sand is at a depth of 12 to 20 inches. Free carbonates are at a depth of 10 to 18 inches. The A horizon is dark grayish brown or grayish brown and in places is gravelly loam. It is 2 to 4 inches thick. The B2t horizon is dark grayish brown to brown and in places is gravelly clay loam. It is 8 to 14 inches thick. The IIC horizon is grayish brown to pale brown and in places the upper part is gravelly sand. It commonly is stratified and in places has thin layers of loamy material.

Murdo soils in Tripp County contain less gravel in the lower part of the solum than is defined in the range for the series, but this difference does not alter their usefulness and behavior.

Murdo soils are mapped with or near Canning, Ree, and Schamber soils and are similar to Dix soils. They are shallower to gravelly sand than Canning and Ree soils. Murdo soils have a distinct B horizon of clay loam, which Dix and Schamber soils do not have.

Okaton series

The Okaton series consists of shallow, strongly sloping to very steep, well drained, clayey soils on uplands. These soils formed in material weathered from underlying shale. The native vegetation is mainly mid grasses.

In a representative profile the surface layer is grayish brown silty clay about 4 inches thick. Next is a transitional layer of grayish brown silty clay about 4 inches thick. The underlying material to a depth of 12

inches is light brownish gray shaly clay. Bedded soft shale is at a depth of 12 inches. The entire profile is calcareous.

Okaton soils are low in fertility and in content of organic matter. Permeability is slow, and available water capacity is very low.

Nearly all areas of these soils remain in native grass and are used for grazing.

Representative profile of Okaton silty clay in an area of Okaton-Lakoma association, 15 to 40 percent slopes, in native grass, 100 feet north and 550 feet east of the southwest corner of sec. 14, T. 101 N., R. 75 W.:

A1—0 to 4 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; slightly hard, firm but crumbly, very sticky and very plastic; strong effervescence; mildly alkaline; clear smooth boundary.

AC—4 to 8 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure parting to weak fine blocky and subangular blocky; slightly hard, firm but crumbly, very sticky and very plastic; few fine shale chips; strong effervescence; mildly alkaline; clear smooth boundary.

C—8 to 12 inches; light brownish gray (2.5Y 6/2) shaly clay, light olive brown (2.5Y 5/3) moist; weak medium blocky and subangular blocky structure; slightly hard, firm but crumbly, sticky and plastic; 50 to 75 percent shale fragments; strong effervescence; mildly alkaline; gradual wavy boundary.

Cr1—12 to 18 inches; light brownish gray (2.5Y 6/2) and light gray (2.5Y 7/2) shale, olive brown (2.5Y 4/4) and light olive brown (2.5Y 5/3) moist; platy bedrock structure; loose and crumbly; few fine segregations of lime; strong effervescence; mildly alkaline; clear wavy boundary.

Cr2cs—18 to 60 inches; light brownish gray (2.5Y 6/2) and light gray (2.5Y 7/2) shale, olive brown (2.5Y 4/4) and light olive brown (2.5Y 5/3) moist; platy bedrock structure; loose and crumbly; many nests of gypsum crystals and segregations of lime in seams and cracks; slight effervescence; mildly alkaline.

Shale bedrock is at a depth of 8 to 20 inches. The A horizon is grayish brown or light brownish gray in hue of 10YR or 2.5Y and is silty clay or clay. It is 2 to 4 inches thick. The AC and C horizons are grayish brown to pale yellow. The AC horizon is silty clay or clay and has few or common shale chips. The C horizon is shaly clay that contains 50 to 90 percent shale fragments. The bedded shale in the Cr horizon is easily dug with a spade. It is mildly alkaline or moderately alkaline.

Okaton soils are mapped with or near Boro, Boyd, Lakoma, Millboro, Promise, and Sansarc soils. Okaton soils are shallower to shale than Boro, Boyd, Lakoma, Millboro, and Promise soils. They contain less clay and are less firm than Sansarc soils.

OAF—Okaton association, 25 to 40 percent slopes. This mapping unit is on the sides of ridges, buttes, and deeply entrenched drainageways. Areas are irregular in shape and are as much as several hundred acres in size. Okaton soils commonly make up 50 to 75 percent of the mapped areas, and Boyd, Manter, and Ree soils make up the rest. Because of the steep slopes and shallowness of the Okaton soil and because some of the less extensive soils are inaccessible for farm machinery, mapping these soils separately was not feasible. In places the Okaton soil has a noncalcareous surface layer.

The Boyd soils are in the middle and lower parts of the landscape where slopes are less steep. In places they make up as much as 40 percent of a mapped area. Manter and Ree soils are on some of the higher ridgetops that are mantled with sandy to loamy material. Outcrops of sandstone and small gravelly spots are in some areas and are shown on the soil map by a spot symbol.

Runoff is rapid. The hazard of erosion is very severe. Controlling water erosion is the main concern in management.

All areas of this mapping unit remain in native vegetation and are used for grazing. Stringers of native trees and shrubs are in the more deeply entrenched drainageways and provide food and cover for wildlife. Capability unit VIIe–8; Shallow range site.

OBE—Okaton-Lakoma association, 15 to 40 percent slopes. This association is on ridges, buttes, and the sides of deeply entrenched drainageways. Areas are irregular in shape and are 200 to more than 500 acres in size. This mapping unit is 45 to 60 percent Okaton soil, 30 to 45 percent Lakoma soil, and 5 to 10 percent other soils. Stones are scattered on the surface in some areas on the sides of buttes. The Okaton soil is on convex ridges and the upper sides of buttes and entrenched drainageways. The Lakoma soil is on the lower part of the landscape. Because these soils are moderately steep to steep, mapping them separately was not feasible. The Okaton soil has the profile described as representative of the Okaton series.

Included with these soils in mapping are small areas of Boro and Promise soils in the lower part of the landscape or on smooth ridgetops. Small gravelly areas are on some of the ridges and are shown on the soil map by a spot symbol.

Runoff is rapid. The hazard of water erosion is very severe if an adequate cover of plants is not maintained. Controlling water erosion is the main concern of management.

All areas of this mapping unit are in native grass and are used for grazing. Capability unit VIIe–8; Okaton part in Shallow range site, Lakoma part in Clayey range site.

OcF—Okaton-Rock outcrop complex, 25 to 60 percent slopes. This complex of steep to very steep soils is on rocky buttes and escarpments. Areas are irregular in shape and are 200 to more than 1,000 acres in size. This complex is 50 to 70 percent Okaton soil, 20 to 40 percent Rock outcrop, and 10 percent other soils. The

Okaton soil has small fragments of rock scattered on the surface and in the soil. Rock outcrop consists of crags and ledges of a hard sandstone that forms a rimrock in the higher part of the landscape.

Included with these soils in mapping are small areas of Westover soils adjacent to the rimrock ledges and peaks.

Runoff is rapid. Controlling water erosion is the main concern in management. This complex is too steep for cultivation and haying.

All areas of this complex are in native vegetation and are used for grazing. Native trees are in some of the deep draws. Rock outcrop is quarried in some areas and is crushed and used for road construction material. Okaton part in capability unit VIIe–8, Shallow range site; Rock outcrop part in capability unit VIIIs–1, not placed in a range site.

Onita series

The Onita series consists of deep, nearly level, moderately well drained silty soils in swales on uplands. These soils formed in alluvium washed in from adjacent soils. The native vegetation is mainly mid and tall grasses.

In a representative profile the surface layer is about 9 inches thick. It is very dark grayish brown heavy silt loam in the upper part and dark grayish brown silty clay loam in the lower part. The subsoil is about 26 inches thick. It is dark grayish brown silty clay loam in the upper part, dark brown silty clay in the middle part, and grayish brown and light brownish gray silty clay loam in the lower part. The lower part is calcareous. The underlying material is light yellowish brown, calcareous silty clay loam that contains spots and streaks of soft lime.

Onita soils are high in fertility and in content of organic matter. Permeability is moderately slow, and available water capacity is high.

Nearly all areas of these soils are used for farming. A few areas remain in native grass and are used for grazing and hay.

Representative profile of Onita silt loam, in cultivation, 100 feet south and 2,120 feet west of the northeast corner of sec. 7, T. 97 N., R. 74 W.:

Ap—0 to 5 inches; very dark grayish brown (10YR 3/2) silt loam, very dark brown (10YR 2.2) moist; weak medium subangular blocky structure parting to moderate very fine granular; soft, very friable; neutral; abrupt smooth boundary.

A12—5 to 9 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to moderate fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

B21t—9 to 15 inches; dark grayish brown (10YR 4/2) heavy silty clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, sticky and plastic; neutral; clear smooth boundary.

B22t—15 to 23 inches; dark brown (10YR 4/3) silty clay, very dark brown (10YR 3/2) moist; weak coarse prismatic structure parting to strong fine and medium blocky; very hard, firm, sticky and plastic; coatings of dark grayish brown (10YR 4/2) in root channels and cracks; neutral; abrupt wavy boundary.

B31—23 to 29 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse blocky structure parting to weak medium blocky; hard, firm, slightly sticky and slightly plastic; coatings of dark grayish brown (10YR 4/2) in root channels and cracks; slight effervescence; mildly alkaline; clear smooth boundary.

B32—29 to 35 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/3) moist; weak coarse blocky structure; slightly hard, friable, slightly sticky and slightly plastic; coatings of dark grayish brown (10YR 4/2) in root channels and cracks; few fine segregations of lime; strong effervescence; moderately alkaline; clear smooth boundary.

Cca—35 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; few fine faint mottles of gray; massive; slightly hard, friable; slightly sticky and slightly plastic; coatings of dark grayish brown (10YR 4/2) in cracks; common medium segregations of lime; strong effervescence; moderately alkaline.

Free carbonates are at a depth of 22 to 35 inches. The A horizon is 8 to 15 inches thick. The B2t horizon is very dark grayish brown to brown in hue of 10YR or 2.5Y and is 12 to 20 inches thick. The B3 horizon is silty clay loam or silty clay and is 5 to 12 inches thick. Some pedons have a B3ca horizon. The C horizon is grayish brown to light yellowish brown in hue of 2.5Y or 10YR and is silty clay loam or silt loam. Some pedons lack mottles in the C horizon and some have a buried A horizon. Segregations of lime are few to many.

Onita soils are mapped with or near Mosher, Reliance, and Scott soils and are similar to Keya and Witten soils. They are more clayey in the B horizon than Keya soils and contain less sodium in the B horizon than Mosher soils. Onita soils are dark in color to a greater depth than Reliance soils and are better drained than Scott soils. They are less clayey in the B horizon than Witten soils.

On—Onita silt loam (0 to 2 percent slopes). This soil is in swales on uplands. Areas are long and narrow. They are 15 to 100 acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Mosher, Reliance, and Scott soils. Mosher soils are at the edges of the mapped areas or on the rims of small depressions. Reliance soils are on slight rises near the edges of the mapped areas. Scott soils are in

small depressions, some of which are shown on the soil map by the wet spot symbol. Gumbo or scabby spots are also shown on the soil map by a spot symbol.

Runoff is slow. This soil receives runoff from adjacent soils. The additional moisture is beneficial in most years. Wetness is a hazard only in years of above-average precipitation. Crop growth is affected by a shortage of moisture in dry years. Conserving moisture is the main concern in management.

Most areas of this soil are in cultivated crops, mainly alfalfa, corn, oats, sorghum, and winter wheat. The use of this soil generally is determined by use of nearby soils. Capability unit IIc–3; Overflow range site.

Oo—Onita-Mosher silt loams (0 to 2 percent slopes). This complex is about 60 percent Onita soil, 30 percent Mosher soil, and 10 percent other soils. Areas generally are long and narrow. They are 40 to 150 acres in size. Slopes are nearly level and are plane to slightly concave. The Mosher soil generally is in the lower part of the landscape. In places the Mosher soil has a thicker surface layer than the soil described as representative of the Mosher series.

Included with these soils in mapping are small areas of Reliance and Scott soils. Reliance soils are on slight rises, generally at the edge of the mapped areas. Scott soils are in small, closed depressions and are shown on the soil map by a wet spot symbol.

Runoff is slow. Most areas receive runoff from adjacent soils. The additional moisture is beneficial to crops in most years, but wetness is a problem early in the growing season in some years. In dry years crop growth is affected by moisture shortages. The claypan subsoil of the Mosher soil takes in water slowly and restricts the development of plant roots. Conserving moisture is the main concern in management, but improving water intake and maintaining tilth are also important on the Mosher soils.

Nearly all areas of this complex are farmed. Alfalfa, corn, oats, sorghum, and winter wheat are the main crops. Onita part in capability unit IIc–3, Overflow range site; Mosher part in capability unit IVs–2, Claypan range site.

Opal series

The Opal series consists of moderately deep, gently sloping to steep, well drained, clayey soils on uplands. These soils formed in material weathered from underlying shale. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is about 7 inches thick; it is dark gray clay in the upper part and dark grayish brown, calcareous clay in the lower part. The subsoil is gray, calcareous clay about 10 inches thick. The underlying material to a depth of 25 inches is gray, calcareous clay. Light brownish gray shale is at a depth of 25 inches.

Opal soils are medium in fertility and moderate in content of organic matter. Permeability is very slow, and available water capacity is low or very low.

Most areas of these soils remain in native grass and are used for grazing hay. A few areas are farmed.

Representative profile of Opal clay, 3 to 9 percent slopes, in native grass, 550 feet east and 700 feet north of the southwest corner of sec. 34, T. 103 N., R. 74 W.:

A11—0 to 3 inches; dark gray (10YR 4/1) clay, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate fine granular; extremely hard, extremely firm, very sticky and very plastic; mildly alkaline; abrupt smooth boundary.

A12—3 to 7 inches; dark grayish brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; weak coarse subangular blocky structure parting to moderate fine granular; extremely hard, extremely firm, very sticky and very plastic; slight effervescence; moderately alkaline; clear smooth boundary.

B2—7 to 17 inches; gray (5Y 5/1) clay, olive gray (5Y 4/2) moist; weak coarse subangular blocky structure parting to moderate medium blocky; extremely hard, extremely firm, very sticky and very plastic; few segregations of lime; slight effervescence; moderately alkaline; gradual smooth boundary.

C—17 to 25 inches; gray (5Y 5/1) clay, olive gray (5Y 4/2) moist; massive; extremely hard, extremely firm, very sticky and very plastic; few fine segregations of lime; slight effervescence; moderately alkaline; clear smooth boundary.

Cr—25 to 60 inches; light brownish gray (2.5Y 6/2) shale, grayish brown (2.5Y 5/2) moist; platy bedrock structure; brittle when dry; few stains of olive yellow (2.5Y 6/6) moist on shale plates; common medium nests of gypsum crystals in cracks and seams; mildly alkaline.

Bedded shale is at a depth of 20 to 40 inches. Free carbonates are at a depth of 7 inches or less. Cracks, about 1 inch wide and several feet long, extend down to the shale when the soil is dry. The A horizon is dark gray to olive gray in hue of 10YR, 2.5Y, or 5Y and is 4 to 7 inches thick. The B2 horizon is dark gray to olive in hue of 5Y or 2.5Y and is 8 to 12 inches thick. Some pedons have a B3 or B3ca horizon. The C horizon is dark gray to pale olive in hue of 5Y or 2.5Y and in places contains fine fragments of shale.

Opal soils are mapped with or near Promise, Sansarc, and Swanboy soils and are similar to Boyd and Lakoma soils. They contain more clay and have firmer consistence than Boyd and Lakoma soils. Opal soils are shallower to shale than Promise and Swanboy soils and are deeper to shale than Sansarc soils.

OpC—Opal clay, 3 to 9 percent slopes. This gently sloping to moderately sloping soil is on uplands. Areas are irregular in shape and are 50 to 150 acres in size. Slopes are plane to convex. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Hurley and Witten soils. Hurley soils are on foot slopes and are shown on the soil map by the symbol for gumbo or scabby spots. Witten soils are in swales.

Runoff is medium. This soil takes in water slowly and is somewhat difficult to work. The hazard of water erosion is severe and the hazard of soil blowing is

moderate. Controlling water erosion and soil blowing is the main concern in management.

Most areas of this soil are in native grass and are used for grazing or hay. Alfalfa and winter wheat are the main cultivated crops. Capability unit IVe–4; Clayey range site.

OsE—Opal-Sansarc clays, 9 to 25 percent slopes. This complex consists of strongly sloping to moderately steep soils. Areas are irregular in shape and are 150 to 300 acres in size. This complex is about 55 percent Opal soils, 35 percent Sansarc soils, and 10 percent other soils. Opal soils are on the sides of ridges and entrenched drainageways. Sansarc soils are on the tops and upper sides of ridges and on the shoulders of entrenched drainageways. In places the Opal soils are slightly shallower to shale than the soil described as representative of the Opal series.

Included with these soils in mapping are Swanboy soils. Swanboy soils are on foot slopes and fans. Small gravelly areas are on some ridges and are shown on the soil map by a spot symbol.

Runoff is rapid. These soils are too steep for cultivation and are subject to water erosion if adequate plant cover is not maintained. Controlling water erosion is the main concern in management.

Almost all areas of this complex are in native grass and are used for grazing. Capability unit VIe–4; Opal part in Clayey range site, Sansarc part in Shallow range site.

Orwet series

The Orwet series consists of deep, nearly level, poorly drained, calcareous, loamy soils on bottom lands and in broad basins. These soils formed in sandy alluvium. The native vegetation is mainly tall grasses.

In a representative profile the surface layer is gray loam about 12 inches thick. The next layer is gray loam about 6 inches thick. The underlying material is gray fine sandy loam and light gray loamy fine sand.

Orwet soils are medium in fertility and moderate in content of organic matter. Permeability is rapid, and available water capacity is moderate. A water table is at a depth of 1 to 5 feet.

Most areas of these soils remain in native grass and are used for hay.

Representative profile of Orwet loam, in native grass, 414 feet south and 1,260 feet east of the northwest corner of sec. 35, T. 97 N., R. 77 W.:

A1ca—0 to 12 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; weak fine and medium granular structure; slightly hard, very friable; violent effervescence; 16 percent calcium carbonate equivalent; mildly alkaline; gradual wavy boundary.

ACca—12 to 18 inches; gray (10YR 6/1) loam, dark gray (10YR 4/1) moist; very weak medium and coarse subangular blocky structure; slightly hard, very friable; violent effervescence; 25 percent calcium carbonate equivalent; moderately alkaline; clear wavy boundary.

C1—18 to 22 inches; gray (10YR 6/1) fine sandy loam, dark grayish brown (10YR 4/2) moist; very weak coarse subangular blocky structure; slightly hard, very friable; violent effervescence; moderately alkaline; gradual wavy boundary.

C2g—22 to 38 inches; light gray (10YR 7/2) loamy fine sand, light brownish gray (10YR 6/2) moist; common faint mottles of dark yellowish brown (10YR 4/4) moist; very weak coarse subangular blocky structure; hard, very friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

C3—38 to 60 inches; gray (10YR 6/1) fine sandy loam, gray (10YR 5/1) moist; massive; hard, friable; strong effervescence; mildly alkaline.

The calcium carbonate equivalent in the A and AC horizons is 15 to 28 percent. The A horizon is dark gray or gray loam or fine sandy loam and is 10 to 18 inches thick. The AC horizon is loam or fine sandy loam and is 4 to 8 inches thick. The C horizon to a depth of 40 inches averages loamy fine sand but it commonly is stratified with sand to fine sandy loam. It has few to many faint to distinct brown, yellowish brown, or dark yellowish brown mottles in some parts of the horizon.

Orwet soils are near Doger and Elsmere soils. They are more calcareous and more poorly drained than Doger and Elsmere soils.

Ow—Orwet loam (0 to 2 percent slopes). This nearly level soil is on bottom lands. Areas are 30 to more than 150 acres in size.

Included with this soil in mapping are small areas of Doger and Elsmere soils. Doger soils are on slight rises and Elsmere soils are near the edges of the mapped areas.

Runoff is slow. Wetness from a high water table delays planting in spring and limits this soil for crops. The high content of lime affects crop growth and causes this soil to blow easily. Controlling wetness and soil blowing is the main concern in management.

Most areas of this soil remain in native grass and are used for hay. Capability unit IVw–1; Subirrigated range site.

Promise series

The Promise series consists of deep, nearly level to moderately sloping, well drained, clayey soils on uplands. These soils formed in clayey material. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is dark grayish brown clay about 5 inches thick. The subsoil is about 22 inches thick. It is dark grayish brown clay in the upper part and grayish brown, calcareous clay in the lower part. The underlying material to a depth of 36 inches is grayish brown, calcareous clay. Below this is light brownish gray, calcareous silty clay that contains nests of gypsum crystals.

Promise soils are medium in fertility and moderate in content of organic matter. Permeability is slow or very slow, and available water capacity is low or moderate.

About half of the acreage is in cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Promise clay, 0 to 3 percent slopes, in native grass, 110 feet south and 900 feet west of the northeast corner of sec. 23, T. 101 N., R. 74 W.:

A1—0 to 5 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; hard, firm, very sticky and very plastic; mildly alkaline; clear smooth boundary.

B21—5 to 8 inches; dark grayish brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; weak medium and coarse prismatic structure parting to moderate medium blocky; extremely hard, extremely firm, very sticky and very plastic; mildly alkaline; abrupt wavy boundary.

B22—8 to 18 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse blocky structure; extremely hard, extremely firm, very sticky and very plastic; common coatings of dark grayish brown along root channels and cracks; slight effervescence; moderately alkaline; gradual wavy boundary.

B3—18 to 27 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse blocky structure; extremely hard, extremely firm, very sticky and very plastic; few coatings of dark grayish brown along root channels and cracks; slight effervescence; moderately alkaline; gradual wavy boundary.

C1—27 to 36 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, extremely firm, very sticky and very plastic; slight effervescence; moderately alkaline; clear wavy boundary.

C2cs—36 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; common medium nests of gypsum crystals; strong effervescence; moderately alkaline.

Cracks, ½ inch to 2 inches wide and several feet long, extend into the C horizon when the soil is dry. The A horizon is dark gray to grayish brown in hue of 10YR or 2.5Y and is clay or silty clay. It is 4 to 8 inches thick and in places it is calcareous. The B horizon is dark grayish brown to light olive gray in hue of 2.5Y or 5Y and in places it is calcareous. Some pedons have segregations of lime in the B3 horizon. The C horizon is grayish brown to pale olive in hue of 2.5Y or 5Y. In places bedded shale is at a depth of 40 to 60 inches.

Promise soils are near Kolls, Lakoma, Millboro, Opal, and Witten soils. They are better drained than Kolls soils and are deeper to shale than Lakoma and Opal soils. Promise soils contain more clay and have a less distinct B horizon than Millboro soils. They have a thinner A horizon than Witten soils.

PrA—Promise clay, 0 to 3 percent slopes. Areas of this soil are irregular in shape and are 50 to more than 200 acres in size. Slopes are long and smooth. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Carter, Millboro, and Witten soils. Carter and Witten soils are in low areas and swales. Millboro soils are on some of the slight rises. Gumbo or scabby spots are in some mapped areas and are shown on the soil map by a spot symbol.

Runoff is slow. This soil takes in water slowly and loses tilth if farmed when wet. It also is subject to soil blowing. Maintaining good tilth, improving water intake, and controlling soil blowing are the main concerns in management.

Most areas of this soil are in cultivated crops, mainly alfalfa, sorghum, and winter wheat. Areas in native grass are used for grazing and hay. Capability unit IIIs–3; Clayey range site.

PrB—Promise clay, 3 to 6 percent slopes. Areas of this soil are irregular in shape and are 40 to more than 150 acres in size. Slopes are long and uniform.

Included with this soil in mapping are small areas of Millboro and Witten soils. Millboro soils are scattered throughout the mapped areas. Witten soils are in swales. Gumbo or scabby spots are in some mapped areas and are shown on the soil map by a spot symbol.

Runoff is medium. This soil takes in water slowly and loses tilth if farmed when wet. It is subject to soil blowing and water erosion. Maintaining good tilth, improving water intake, and controlling soil blowing and water erosion are the main concerns in management.

Most areas of this soil are in cultivated crops, mainly alfalfa, sorghum, and winter wheat. Areas in native grass are used for grazing and hay. Capability unit IIIe–4; Clayey range site.

PrC—Promise clay, 6 to 9 percent slopes. Areas of this soil are irregular in shape and are 40 to more than 150 acres in size. Slopes are mostly long and uniform. This soil has a thinner subsoil than the soil described as representative of the series.

Included with this soil in mapping are small areas of Boro, Millboro, and Witten soils. Boro soils are on the tops and upper sides of some of the convex ridges. Millboro soils are intermingled throughout some of the mapped areas. Witten soils are in swales. Gumbo or scabby spots are in some mapped areas and are shown on the soil map by a spot symbol.

Runoff is medium to rapid. In cultivated areas, the hazards of water erosion and soil blowing are severe. Controlling soil blowing and water erosion is the main concern in management.

About half of the acreage is in cultivated crops, mainly sorghum and winter wheat. Areas in native grass are used for grazing and hay. Capability unit IVe–4; Clayey range site.

PsA—Promise clay, channeled, 0 to 2 percent slopes. This nearly level soil is on valley terraces. Areas are long and narrow and are dissected into small tracts by a deep meandering channel. This soil has a thicker surface layer than the soil described as representative of the series.

Included with this soil in mapping are small areas of Carter, Hurley, Millboro, and Witten soils. Carter and Hurley soils are in slightly concave, low areas.

Millboro soils are on slight rises. Witten soils are in swales and near the edges of the mapped areas.

Runoff is slow. This soil is subject to flooding in spring and after heavy rains. Most areas are impractical to farm because of the meandering channels.

Most areas of this soil remain in native vegetation and are used for grazing. Stringers of native trees grow along some of the channels and provide cover for wildlife and winter protection for livestock. Capability unit VIw–1; Overflow range site.

PtA—Promise clay, loamy substratum, 0 to 2 percent slopes. This nearly level soil is on bottom lands along the White River. Areas are 50 to 200 acres in size. The profile is similar to the one described as representative of the series, but the underlying material is stratified with thin layers of loam, silt loam, or silty clay loam.

Included with this soil in mapping are small areas of Haverson and Swanboy soils. Haverson soils are in lower-lying areas that are nearer to the river. Swanboy soils are on foot slopes and in fans at the edge of the river valley.

Runoff is slow. This soil takes in water slowly and is difficult to work. It is also subject to soil blowing. Improving water intake, maintaining tilth, and controlling soil blowing are the main concerns in management.

Most areas of this soil are farmed. Alfalfa, sorghum, and winter wheat are the main crops. Areas in native grass are used for grazing and hay. Clumps of native trees provide cover for wildlife and livestock. Capability unit IIIs–3; Clayey range site.

Ree series

The Ree series consists of deep, nearly level to strongly sloping, well drained soils on uplands. These soils formed in loamy material.

In a representative profile the surface layer is dark grayish brown loam about 7 inches thick. The subsoil is clay loam about 19 inches thick. It is dark grayish brown in the upper part, grayish brown in the middle part, and light brownish gray in the lower part. The lower part is calcareous. The underlying material is light brownish gray, calcareous clay loam and loam.

Ree soils are medium in fertility and moderate in content of organic matter. Permeability is moderate, and available water capacity is high.

About half of the acreage is used for farming. Areas in native grass are used for grazing and hay.

Representative profile of Ree loam, 0 to 3 percent slopes, in cultivation, 200 feet east and 2,340 feet north of the southwest corner of sec. 28, T. 102 N., R. 78 W.:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; cloddy and weak fine and medium granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

B21t—7 to 15 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium blocky; hard, firm, slightly sticky and slightly plastic; mildly alkaline; clear smooth boundary.

B22t—15 to 20 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; very hard, very firm, slightly sticky and slightly plastic; dark grayish brown coatings on faces of peds; mildly alkaline; abrupt wavy boundary.

B3ca—20 to 26 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure parting to weak medium subangular blocky; hard, firm, slightly sticky and slightly plastic; few fine segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C1ca—26 to 46 inches; light brownish gray (2.5Y 6/2) light clay loam; grayish brown (2.5Y 5/2) moist; massive; hard, firm, slightly sticky and slightly plastic; few fine segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—46 to 60 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; slight effervescence; moderately alkaline.

Free carbonates are at a depth of 16 to 30 inches. The A horizon is dark gray to grayish brown and in places is silt loam. It is 4 to 8 inches thick. The B2t horizon commonly is clay loam but ranges from sandy clay loam to silty clay loam. It is 12 to 22 inches thick. The B3 horizon is grayish brown or light brownish gray in hue of 2.5Y or 10YR and is clay loam or sandy clay loam. It is 4 to 10 inches thick and in places is noncalcareous. The C horizon is light brownish gray, pale brown, or light yellowish brown in hue of 2.5Y or 10YR. It commonly is sandy loam to clay loam, and in places it is stratified with lenses of finer or coarser material. In places gravelly material is at a depth of 40 to 60 inches.

Ree soils are near Canning, Kadoka, Manter, Murdo, Reliance, and Rosebud soils. They are deeper over gravelly sand than Canning and Murdo soils and are deeper to bedrock than Kadoka and Rosebud soils. Ree soils are more clayey in the B horizon than Manter soils and are less clayey than Reliance soils.

RaA—Ree loam, 0 to 3 percent slopes. Areas of this nearly level to very gently sloping soil are irregular in shape and are 20 to more than 200 acres in size. Slopes generally are long and smooth. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Keya, Kolls, and Mosher soils. Keya soils are in swales. Kolls soils are in small, shallow depressions and are shown on the soil map by a wet spot symbol. Mosher soils are on flats and around the heads of shallow drainageways. Gumbo or scabby spots are in some areas and are also shown on the soil map by a spot symbol.

Runoff is slow. This soil has little or no limitation for crops other than periodic shortages of moisture.

Conserving moisture is the main concern in management.

Most areas of this soil are farmed. Alfalfa, corn, and small grain are the main crops. Forage sorghum is grown in some areas. Areas in native grass are used for grazing and hay. Capability unit IIc–2; Silty range site.

RaB—Ree loam, 3 to 6 percent slopes. Areas of this gently sloping soil are irregular in shape and are 50 to more than 200 acres in size.

Included with this soil in mapping are small areas of Kadoka, Keya, Mosher, and Rosebud soils. Kadoka and Rosebud soils are in places that are underlain by siltstone or sandstone at a moderate depth. Keya soils are in swales. Mosher soils are on foot slopes and in some swales. Small gravelly areas on ridges, small wet spots, and gumbo or scabby spots are in some areas and are shown on the soil map by spot symbols.

Runoff is medium. The hazard of water erosion is moderate. Controlling water erosion is the main concern in management.

About half of the acreage is in cultivated crops. Alfalfa, corn, and small grain are the main crops. Capability unit IIe–1; Silty range site.

RaC—Ree loam, 6 to 9 percent slopes. Areas of this moderately sloping soil are irregular in shape and are 40 to more than 200 acres in size. Slopes are mostly convex. This soil has a thinner surface layer and a thinner subsoil than the soil described as representative of the series.

Included with this soil in mapping are small areas of Canning, Kadoka, Keya, Lakoma, Mosher, Murdo, and Rosebud soils. Canning and Murdo soils are on some of the ridges. Kadoka, Lakoma, and Rosebud soils are in places that are underlain by siltstone, sandstone, or shale at a moderate depth. Mosher soils are on foot slopes and in some swales. Small gravelly areas and gumbo or scabby spots are shown on the soil map by spot symbols.

Runoff is medium. The hazard of erosion in cultivated areas is severe. Controlling water erosion is the main concern in management.

Many areas of this soil are used for small grain, corn, and alfalfa. Other areas remain in native grass and are used for grazing and hay. Capability unit IIIe–1; Silty range site.

RaD—Ree loam, 9 to 15 percent slopes. Areas of this mostly strongly sloping soil are irregular in shape and are 100 to more than 200 acres in size. They commonly consist of convex ridges and entrenched drainageways. Small steeper areas are on the sides of drainageways. This soil has a thinner surface layer and a thinner subsoil than the soil described as representative of the series.

Included with this soil in mapping are small areas of Dix, Lakoma, and Okaton soils. Dix soils are on some of the high ridges and on the shoulders of deeply entrenched drainageways. Lakoma and Okaton soils are on the sides of some of the entrenched drainageways. Small gravelly areas and outcrops of sandstone or shale are in some areas and are shown on the soil map by spot symbols.

Runoff is medium. If this soil is farmed, the hazard of water erosion is severe. Controlling water erosion is the main concern in management.

Most areas of this soil remain in native grass and are used for grazing. The presence of entrenched drainageways causes cultivation to be impractical in some areas. Alfalfa and small grain are the main crops in the few cultivated areas. Capability unit IVe–1; Silty range site.

Reliance series

The Reliance series consists of deep, nearly level to moderately sloping, well drained, silty soils on uplands. These soils formed in loess. The native vegetation is mainly mid and short grasses.

In a representative profile (fig. 12) the surface layer is dark grayish brown silty clay loam about 7 inches

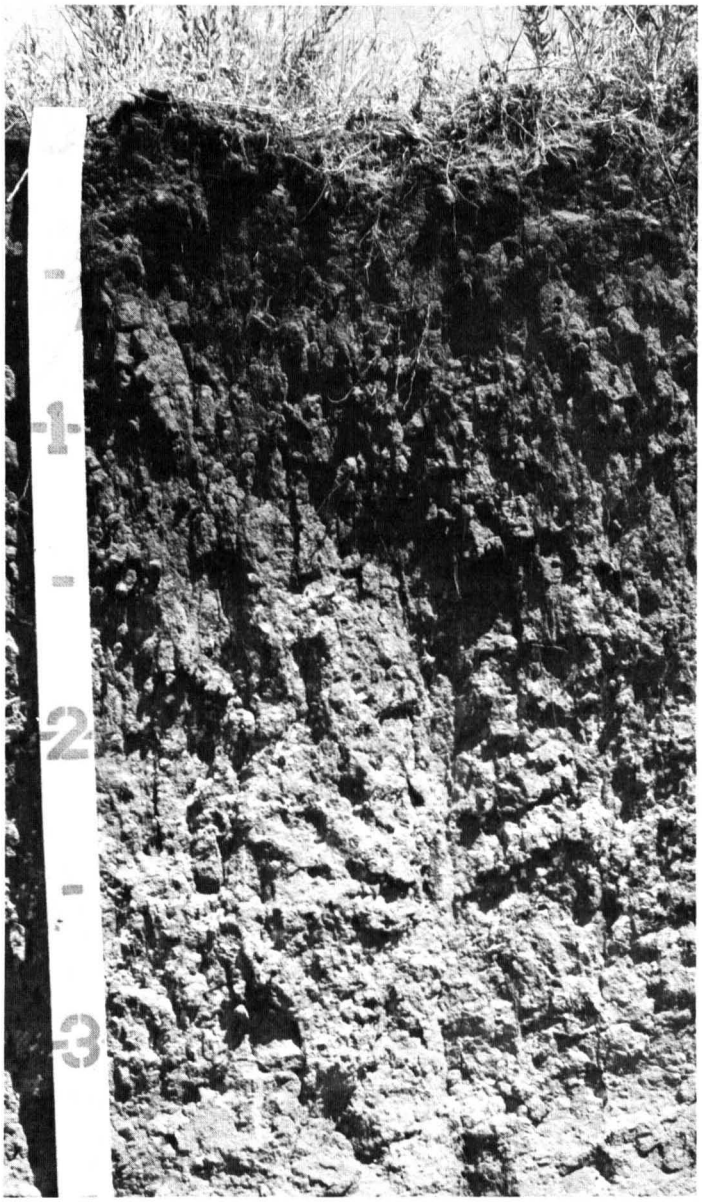

Figure 12.—**Profile of Reliance silty clay loam, 0 to 3 percent slopes.**

thick. The subsoil is silty clay loam about 23 inches thick; it is dark brown in the upper part, brown in the middle part, and pale brown in the lower part. The lower part of the subsoil is calcareous and has spots of soft lime that extend into the underlying material. The underlying material to a depth of 42 inches is pale brown, calcareous silty clay loam. Light brownish gray, calcareous silt loam is at a depth of 42 inches.

Reliance soils are medium in fertility and moderate in content of organic matter. Permeability is moderately slow, and available water capacity is high.

Most areas of these soils are in cultivated crops. A few areas remain in native grass and are used for grazing and hay.

Representative profile of Reliance silty clay loam, 0 to 3 percent slopes, in cultivation, 130 feet south and 800 feet east of the northwest corner of sec. 7, T. 97 N., R. 74 W.:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; cloddy and moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; neutral; abrupt smooth boundary.

B21t—7 to 11 inches; dark brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to strong medium and fine subangular blocky; hard, firm, slightly sticky and slightly plastic; common tongues of dark grayish brown; neutral; clear smooth boundary.

B22t—11 to 19 inches; brown (10YR 5/3) heavy silty clay loam, dark brown (10YR 4/3) moist; weak medium and coarse prismatic structure parting to strong medium and fine subangular blocky and blocky; hard, firm, sticky and plastic; common tongues of dark brown; neutral; abrupt wavy boundary.

B31—19 to 22 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak coarse blocky structure parting to moderate medium and fine blocky; hard, firm, slightly sticky and slightly plastic; few fine segregations of lime; slight effervescence; mildly alkaline; clear wavy boundary.

B32ca—22 to 30 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak coarse blocky structure parting to moderate medium blocky; hard, firm, slightly sticky and slightly plastic; common medium segregations of lime; strong effervescence; mildly alkaline; clear wavy boundary.

C1ca—30 to 42 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common medium segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

C2—42 to 60 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable; slight effervescence; mildly alkaline.

Free carbonates are at a depth of 18 to 34 inches. The A horizon is dark grayish brown or grayish brown and is 6 to 10 inches thick. The B2t horizon is dark grayish brown to brown and is 12 to 18 inches thick. The B3 horizon is grayish brown to pale brown and is silty clay loam or silt loam. It is 6 to 16 inches thick and in places the upper part is noncalcareous. The B3 and C1ca horizons contain few to many segregations of lime. The C horizon is grayish brown to very pale brown or pale yellow. It commonly is silty clay loam or silt loam, but in places the lower part below a depth of 40 inches is clay or gravelly sand.

Reliance soils are near Lakoma, Millboro, Mosher, Onita, and Ree soils. They are less clayey in the B horizon and are deeper to free carbonates than Lakoma and Millboro soils. Reliance soils contain less sodium than Mosher soils and do not have columnar structure in the B horizon. They have dark colors that extend to a shallower depth than Onita soils and are more clayey in the B horizon than Ree soils.

ReA—Reliance silty clay loam, 0 to 3 percent slopes. Areas of this nearly level to very gently sloping soil are irregular in shape and are 40 to more than 200 acres in size. Slopes are mostly long and smooth. This soil has the profile described as representative of the series, but in places the surface layer is silt loam. In some areas stones are scattered on the surface.

Included with this soil in mapping are small areas of Onita, Mosher, and Scott soils. Onita soils are in swales. Mosher soils are on flats or slightly concave, low areas. Scott soils are in shallow depressions, some of which are shown on the soil map by a wet spot symbol. Gumbo or scabby spots are in some areas and are also shown on the soil map by a spot symbol.

Runoff is slow. This soil has few limitations for crops except periodic shortages of moisture. Conserving moisture is the main concern in management.

Most areas of this soil are in cultivated crops, mainly alfalfa, corn, oats, winter wheat, and sorghum. Capability unit IIc–2; Silty range site.

ReB—Reliance silty clay loam, 3 to 6 percent slopes. Areas of this gently sloping soil are irregular in shape and are 30 to more than 200 acres in size. Slopes are long and smooth. A few stones are scattered on the surface in some areas.

Included with this soil in mapping are small areas of Millboro, Onita, and Scott soils. Millboro soils are on the sides of some ridges. Onita soils are in swales. Scott soils are in small, closed depressions and are shown on the soil map by a wet spot symbol. Small gravelly areas and gumbo or scabby spots are in some areas and are also shown on the soil map by spot symbols.

Runoff is medium. The hazard of water erosion is moderate. Controlling water erosion is the main concern in management.

Most areas of this soil are in cultivated crops, mainly alfalfa, corn, oats, winter wheat, and sorghum. Capability unit IIe–1; Silty range site.

ReC—Reliance silty clay loam, 6 to 9 percent slopes. Areas of this moderately sloping soil are irregular in shape and are 50 to more than 200 acres in size.

Slopes are smooth and convex. This soil has a thinner surface layer and a thinner subsoil than the soil described as representative of the series. Also, on some ridges the surface layer is calcareous, and in some areas stones are scattered on the surface.

Included with this soil in mapping are small areas of Millboro and Onita soils. Millboro soils are in the mid and lower parts of the landscape. Onita soils are in swales. Small gravelly areas and gumbo or scabby spots are in some areas and are shown on the soil map by spot symbols.

Runoff is medium. The hazard of water erosion is moderate to severe. Controlling water erosion is the main concern in management.

Most areas of this soil are in cultivated crops, mainly alfalfa, corn, oats, winter wheat, and sorghum. Capability unit IIIe–1; Silty range site.

ReC2—Reliance silty clay loam, 6 to 9 percent slopes, eroded. This moderately sloping soil is on uplands. Areas are irregular in shape and are 50 to more than 200 acres in size. Slopes are short and convex. Most of the mapped areas are moderately to severely eroded. Part or all of the original surface layer has been removed by erosion and the remainder is mixed with the subsoil by plowing. This soil has a lighter colored surface layer and is shallower to lime than the soil described as representative of the series. A few large stones are scattered on the surface on some higher ridges.

Included with this soil in mapping are small areas of Onita soils in swales. Small gravelly areas are on some ridges and are shown on the soil map by a spot symbol.

Runoff is medium. Erosion has lowered the level of fertility, and the hazard of continuing erosion is severe. Controlling water erosion and improving fertility are the main concerns in management.

Most areas of this soil are in cultivated crops, mainly alfalfa, corn, oats, winter wheat, and sorghum. A few areas are in tame or native grass. Capability unit IVe–1; Silty range site.

Ronson series

The Ronson series consists of moderately deep, nearly level to gently sloping, well drained, loamy soils on uplands. These soils formed in sandy material weathered from underlying sandstone. The native vegetation is mainly mid and tall grasses.

In a representative profile the surface layer is dark grayish brown fine sandy loam about 8 inches thick. The next layer is light gray, calcareous sandy loam about 6 inches thick. The underlying material to a depth of 24 inches is white, calcareous sandy loam. White, weakly cemented sandstone is at a depth of 24 inches.

Ronson soils are medium to low in fertility and moderately low in content of organic matter. Permeability is moderately rapid, and available water capacity is low or very low.

Most areas of this soil remain in native grass and are used for grazing. A few areas are in cultivated crops.

Representative profile of Ronson fine sandy loam, 0 to 4 percent slopes, in native grass, 1,800 feet south and 125 feet east of the northwest corner of sec. 35, T. 95 N., R. 79 W.:

A11—0 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable; neutral; clear smooth boundary.

A12—3 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak medium granular; soft, very friable; mildly alkaline; clear wavy boundary.

AC—8 to 14 inches; light gray (10YR 7/2) sandy loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure parting to weak medium subangular blocky; soft, very friable; violent effervescence; moderately alkaline; gradual wavy boundary.

C—14 to 24 inches; white (10YR 8/2) sandy loam, pale brown (10YR 6/3) moist; massive; soft, very friable; few fine fragments of sandstone; violent effervescence; moderately alkaline; gradual wavy boundary.

Cr—24 to 60 inches; white (10YR 8/1) weakly cemented sandstone, very pale brown (10YR 7/3) moist; violent effervescence; moderately alkaline.

Soft sandstone is at a depth of 20 to 40 inches. In some cultivated areas free carbonates are at or near the surface. The A horizon is dark grayish brown or grayish brown and is 7 to 10 inches thick. The AC horizon is grayish brown to light gray and is 4 to 7 inches thick. The C horizon is light gray or white. The sandstone in the Cr horizon is weakly cemented to strongly cemented.

Ronson soils are mapped with or near Anselmo, Doger, Holt, Valentine, and Vetal soils and are similar to Chappell soils. They are shallower to sandstone than Anselmo, Doger, Valentine, and Vetal soils. Ronson soils are calcareous at a shallower depth than Chappell soils and are underlain at a moderate depth by sandstone rather than by gravelly sand. In contrast to Holt soils, Ronson soils have little or no increase of clay content in the B horizon. They are deeper to sandstone than Tassel soils.

RfA—Ronson fine sandy loam, 0 to 4 percent slopes. Areas of this nearly level to gently undulating soil are irregular in shape and are 20 to more than 150 acres in size. Slopes are mostly convex. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Anselmo, Doger, Tassel, and Vetal soils. Anselmo and Doger soils are on the sides of low ridges and knolls. Tassel soils are on some of the low ridgecrests. Vetal soils are in swales. Small wet spots and gumbo or scabby spots are in some mapped areas and are shown on the soil map by spot symbols.

Runoff is slow, and most of the rainfall enters the soil. This soil is easy to work, but it is subject to soil blowing. Controlling soil blowing is the main concern in management.

Most areas of this soil remain in native grass and are used for grazing. Alfalfa, corn, and small grain are the main crops. Capability unit IIIe–9; Sandy range site.

RoB—Ronson-Tassel fine sandy loams, 0 to 6 percent slopes. This complex is on tablelands dissected by the heads of drainages. The soils are mostly nearly level to gently sloping, but some slopes are greater than 6 percent in some areas. Areas are irregular in shape and are 40 to more than 200 acres in size. This complex is about 45 percent Ronson soil, 35 percent Tassel soil, and 20 percent other soils. The Tassel soil is generally on convex ridges, but in some places is nearly level.

Included with these soils in mapping are Anselmo, Doger, and Vetal soils. Anselmo and Doger soils are scattered throughout the mapped areas. Vetal soils are in swales. Small wet spots are in some areas and are shown on the soil map by a spot symbol.

Runoff is slow. These soils are subject to soil blowing if adequate plant cover is not maintained. Controlling soil blowing is the main concern in management. The Tassel soil is not suited to cultivated crops.

Nearly all areas of these soils remain in native grass and are used for grazing. In many areas cultivation is not practical because the soils are so closely intermingled. Ronson part in capability unit IIIe–9, Sandy range site; Tassel part in capability unit VIe–10; Shallow range site.

Rosebud series

The Rosebud series consists of moderately deep, gently sloping to strongly sloping, well drained, loamy soils on uplands. These soils formed in material weathered from underlying sandstone. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is dark grayish brown loam about 5 inches thick. The subsoil is about 16 inches thick; it is dark grayish brown clay loam in the upper part, brown loam in the middle part, and pale brown very fine sandy loam in the lower part. The underlying material to a depth of 30 inches is very pale brown very fine sandy loam. Very pale brown, soft, calcareous sandstone is at a depth of 30 inches.

Rosebud soils are medium in fertility and moderate in content of organic matter. Permeability is moderate, and available water capacity is low.

About half the acreage is in cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Rosebud loam in an area of Rosebud-Canyon loams, 6 to 9 percent slopes, in cropland, 132 feet east and 150 feet south of the northwest corner of sec. 15, T. 102 N., R. 75 W.:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; cloddy and weak fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

B21t—5 to 8 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable; neutral; abrupt smooth boundary.

B22t—8 to 14 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable; coatings of dark grayish brown on faces of peds; neutral; clear smooth boundary.

B3—14 to 20 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; slightly hard, very friable; mildly alkaline; gradual wavy boundary.

C—20 to 30 inches; very pale brown (10YR 7/3) very fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; mildly alkaline; abrupt wavy boundary.

Cr—30 to 60 inches; very pale brown (10YR 7/3) soft sandstone that crushes to very fine sandy loam, pale brown (10YR 6/3) moist; platy bedrock structure; brittle when dry; strong effervescence; moderately alkaline.

Soft sandstone is at a depth of 20 to 40 inches. Free carbonates are at a depth of 15 to 30 inches. The A and B2t horizons are neutral or mildly alkaline. The A horizon is dark grayish brown or grayish brown and is 4 to 7 inches thick. The B2t horizon is 7 to 12 inches thick. The B3 horizon is grayish brown to very pale brown and in places is loam or clay loam. It is 4 to 6 inches thick. The C horizon is pale brown or very pale brown and is very fine sandy loam or loam. In places the C horizon contains fine fragments of cemented sandstone and in places it is calcareous. The sandstone in the Cr horizon is weakly cemented to moderately cemented.

Rosebud soils are mapped with or near Canyon, Keya, Manter, and Ree soils and are similar to Holt and Kadoka soils. They are deeper to sandstone than Canyon soils and are shallower to sandstone than Keya, Manter, and Ree soils. Rosebud soils have a thinner A horizon than Keya soils and are more clayey in the B horizon than Manter soils. They are more clayey in the B horizon than Holt soils and are less silty than Kadoka soils.

RsB—Rosebud loam, 3 to 6 percent slopes. Areas of this gently sloping soil are irregular in shape and are 50 to more than 150 acres in size. Slopes are convex. In places the surface layer is fine sandy loam.

Included in mapping are small areas of Canyon, Keya, and Ree soils. Canyon soils are on some ridges. Keya soils are in swales. Ree soils are on foot slopes. Small wet spots and gumbo or scabby spots are in some mapped areas and are shown on the soil map by spot symbols.

Runoff is medium. This soil is easy to work, but it is subject to water erosion. Controlling water erosion is the main concern in management.

Most areas of this soil are in cultivated crops, mainly alfalfa, corn, and oats. Areas in native grass are used for grazing and hay. Capability unit IIe–1; Silty range site.

RuC—Rosebud-Canyon loams, 6 to 9 percent slopes.

Areas of this complex are irregular in shape and are 50 to more than 200 acres in size. Slopes are convex. This complex is about 60 percent Rosebud soil, 25 percent Canyon soil, and 15 percent other soils. The Rosebud soil is on the middle and lower parts of the landscape. The Canyon soil is on the convex ridges. The Rosebud soil has the profile described as representative of the Rosebud series. In some cultivated areas the Canyon soil is moderately eroded.

Included with these soils in mapping are small areas of Keya and Ree soils. Keya soils are in swales. Ree soils are mostly on foot slopes. Small gravelly areas and gumbo or scabby spots are in some mapped areas and are shown on the soil map by a spot symbol.

Runoff is medium. These soils are subject to water erosion. The shallow Canyon soil is not suited to cultivated crops. Controlling water erosion is the main concern in management.

About half of the acreage is in cultivated crops, mainly alfalfa, corn, and oats. Areas in native grass are used for grazing. Rosebud part in capability unit IIIe–1, Silty range site; Canyon part in capability unit VIe–11, Shallow range site.

RuD—Rosebud-Canyon loams, 9 to 15 percent slopes. This complex is on ridges and the sides of entrenched drainageways. Areas are irregular in shape and are 75 to more than 200 acres in size. This complex is about 55 percent Rosebud soil, 35 percent Canyon soil, and 10 percent other soils. The Rosebud soil is on the sides of the ridges and drainageways. The Canyon soil is on the ridges and on the shoulders of drainageways. The Canyon soil has the profile described as representative of the Canyon series.

Included with these soils in mapping are small areas of Keya and Ree soils. Keya soils are in swales. Ree soils are on some of the higher and wider ridgetops. Small gravelly areas are on some ridges and are shown on the soil map by a spot symbol.

Runoff is medium to rapid. These soils are subject to water erosion if adequate plant cover is not maintained. Controlling water erosion is the main concern in management. The shallow Canyon soil is not suited to cultivated crops.

Nearly all areas of these soils are in native grass and are used for grazing. In many areas the pattern of the two soils is such that cultivation is not feasible. Rosebud part in capability unit IVe–1, Silty range site; Canyon part in capability unit VIe–11, Shallow range site.

Sansarc series

The Sansarc series consists of shallow, strongly sloping to steep, well drained, clayey soils on uplands. These soils formed in material weathered from underlying shale. The native vegetation is mainly mid grasses.

In a representative profile the surface layer is grayish brown clay about 4 inches thick. The underlying material to a depth of 17 inches is olive gray clay and shaly clay. Gray and olive gray soft shale is at a depth of 17 inches. The entire profile is calcareous.

Sansarc soils are low in fertility and in content of organic matter. Permeability is slow, and available water capacity is very low.

Almost all areas of these soils remain in native grass and are used for grazing.

Representative profile of Sansarc clay in an area of Sansarc-Opal association, 15 to 40 percent slopes, in native grass, 2,400 feet north and 1,800 feet west of the southeast corner of sec. 6, T. 102 N., R. 77 W.:

A1—0 to 4 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and fine granular structure; hard, firm, very sticky and very plastic; strong effervescence; mildly alkaline; clear smooth boundary.

C1—4 to 11 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; weak medium blocky structure; hard, firm, very sticky and very plastic; few shale chips; strong effervescence; mildly alkaline; clear wavy boundary.

C2—11 to 17 inches; olive gray (5Y 5/2) shaly clay, dark gray (5Y 4/1) moist; fine earth is massive; slightly hard, firm, sticky and plastic; many fragments of soft shale; few fine segregations of lime; strong effervescence; moderately alkaline; clear wavy boundary.

Cr—17 to 60 inches; gray (5Y 5/1 and 6/1) and olive gray (5Y 5/2) bedded shale, dark gray (5Y 4/1) and olive gray (5Y 4/2) moist; platy bedrock structure; plates are brittle when dry; thin bands and splotches with olive (5Y 5/4 and 5/6) stained shale plates; few fine segregations of lime in upper part; slight effervescence; mildly alkaline.

Shale is at a depth of 8 to 20 inches. The A horizon is grayish brown or light brownish gray and is 2 to 4 inches thick. The C horizon is grayish brown to pale olive in hue of 2.5Y or 5Y. Shale chips are more than 50 percent of the C2 horizon by volume. Few to many iron and manganese stains are in seams and cracks of the shale. In places the shale lacks free carbonates.

Sansarc soils are mapped with or near Boyd, Lakoma, Okaton, Opal, and Promise soils. They are shallower to shale than Boyd, Lakoma, Opal, and Promise soils. Sansarc soils are more clayey and are less calcareous than Okaton soils.

SAE—Sansarc-Opal association, 15 to 40 percent slopes. This association of moderately steep to steep soils is on the breaks of the White River. Areas are irregular in shape and are 100 to more than 500 acres in size. They are commonly dissected by numerous entrenched drainageways, some of which have gullied channels. This association is 60 to 75 percent Sansarc soil, 15 to 30 percent Opal soil, and 10 percent other soils. Because of steep slopes and shallowness, mapping these soils separately was not feasible. The Sansarc soil is on the convex ridges. The Opal soil is on the lower part of the landscape and on some of the wide ridges between drainageways. The Sansarc soil has the profile described as representative of the Sansarc series. In places the Opal soil is shallower to shale than the soil described as representative of the Opal series.

Included with these soils in mapping are small areas of Schamber, Swanboy, and Westover soils.

Schamber and Westover soils are on some of the high ridges or high terrace fronts. Swanboy soils are on foot slopes and along drainageways. Small gravelly areas are in some places and are shown on the soil map by a spot symbol.

Runoff is rapid. These soils are subject to severe water erosion if adequate plant cover is not maintained. Controlling water erosion is the main concern in management.

All areas of this mapping unit are in native grass and are used for grazing. Capability unit VIIe–8; Sansarc part in Shallow range site, Opal part in Clayey range site.

ScF—Sansarc-Shale outcrop complex, 25 to 40 percent slopes. This complex of steep soils are in the breaks of the White River. Areas are irregular in shape and are 100 to more than 200 acres in size. This complex is about 60 percent Sansarc soil, 30 percent Shale outcrop, and 10 percent other soils. The Shale outcrop part of this complex is on the higher part of the landscape on the upper sides of ridges, around the heads of drainageways, and on almost vertical escarpments near the river. Gray, platy shale is at a depth of a few inches or less in the Shale outcrop part. Many concretions of manganese and iron are scattered on the surface.

Included with these soils in mapping are small areas of Swanboy soils on foot slopes and in swales.

Runoff is very rapid. These soils are subject to severe water erosion, and the areas commonly have many gullies. Controlling water erosion is the main concern in management.

All areas of this complex remain in native vegetation and are used for grazing. The Shale outcrop part is bare of vegetation or has a very sparse cover of forbs and weeds. Sansarc part in capability unit VIIe–8, Shallow range site; Shale outcrop part in capability unit VIIIs–2, not placed in a range site.

Schamber series

The Schamber series consists of moderately steep to steep, well drained to excessively drained soils on terrace fronts. The soils are very shallow to gravelly sand, and they formed in gravelly material. The native vegetation is mainly short and mid grasses.

In a representative profile the surface layer is about 8 inches thick; the upper part is dark grayish brown gravelly loam and the lower part is grayish brown and brown, calcareous gravelly sandy loam. The underlying material to a depth of 18 inches is pale brown and very pale brown, calcareous gravelly sand. Light gray and very pale brown, calcareous very gravelly sand is at a depth of 18 inches.

Schamber soils are low in fertility and in content of organic matter. Permeability is rapid, and available water capacity is low.

All areas of these soils remain in native grass and are used for grazing.

Representative profile of Schamber gravelly loam in an area of Schamber-Murdo complex, 15 to 40 percent slopes, in native grass, 1,700 feet northeast and 400 feet west of where the trail starts in the southwest quarter of sec. 8, T. 102 N., R. 79 W.:

A11—0 to 4 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable; neutral; abrupt smooth boundary.

A12—4 to 8 inches; grayish brown (10YR 5/2) and brown (10YR 5/3) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable; strong effervescence; mildly alkaline; clear wavy boundary.

C1ca—8 to 18 inches; pale brown (10YR 6/3) and very pale brown (10YR 7/3) gravelly sand, brown (10YR 5/3) moist; single grained; loose; coatings of lime on undersides of gravel; violent effervescence; moderately alkaline; gradual wavy boundary.

C2ca—18 to 60 inches; light gray (10YR 7/2) and very pale brown (10YR 7/3) very gravelly sand, yellowish brown (10YR 5/4) moist; single grained; loose; coatings of lime on undersides of gravel; violent effervescence; moderately alkaline.

Gravelly sand is at a depth of 4 to 10 inches. Free carbonates are at a depth of 10 inches or less. The A horizon is 4 to 10 inches thick.

Schamber soils are mapped with or near Canning, Murdo, and Ree soils. They are shallower to gravelly sand than Canning and Ree soils. Schamber soils do not have a B2t horizon of gravelly clay loam, which Murdo soils have.

ShE—Schamber-Murdo complex, 15 to 40 percent slopes. This complex of moderately steep to steep soils are on terrace fronts and around the heads of entrenched drainageways (fig. 13). Areas are long and narrow. They are 50 to more than 200 acres in size. Slopes generally are short and convex. This complex is about 45 percent Schamber soil, 35 percent Murdo soil, and 20 percent other soils. The Schamber soil is on the tops and upper sides of convex ridges. The Murdo soil is on flat areas above the Schamber soil and on some foot slopes. Both soils have the profiles described as representative of their respective series.

Included with these soils in mapping are small areas of Canning and Sansarc soils. Canning soils are intermingled with Murdo soils. Sansarc soils are on the lower sides of entrenched drainageways. Gravel pits are in some mapped areas and are shown on the soil map by a spot symbol.

Runoff is medium. These soils are too droughty and too steep for cultivation. They are subject to water erosion and soil blowing if the plant cover is removed.

All areas of this complex remain in native grass and are used for grazing. Native trees and shrubs are in some of the draws. Capability unit VIIs–4; Schamber part in Very Shallow range site, Murdo part in Shallow to Gravel range site.

Scott series

The Scott series consists of deep, nearly level, poorly drained soils in closed depressions on uplands. These soils formed in clayey alluvium washed in from adja-

cent soils. The native vegetation is mainly mid and tall grasses.

In a representative profile the surface layer is dark grayish brown silt loam about 3 inches thick. The subsurface layer is gray silt loam about 3 inches thick. The subsoil is dark gray clay about 25 inches thick. The underlying material is dark gray and grayish brown, calcareous clay.

Scott soils are medium in fertility and moderate in content of organic matter. Permeability is very slow, and available water capacity is moderate. These soils are subject to flooding by ponded water early in the growing season.

Most areas of these soils remain in native grass and are used for hay. A few areas are farmed.

Representative profile of Scott silt loam, in native grass, 500 feet west and 1,900 feet south of the northeast corner of sec. 8, T. 97 N., R. 74 W.:

A1—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam; very dark gray (10YR 3/1) moist; weak fine subangular blocky structure parting to weak fine granular; soft, very friable; slightly acid; clear smooth boundary.

A2—3 to 6 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak thick platy structure parting to moderate medium granular; slightly hard, friable; few fine rust stains; slightly acid; abrupt smooth boundary.

B21t—6 to 14 inches; dark gray (10YR 4/1) clay, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium and fine blocky; extremely hard, extremely firm, very sticky and very plastic; neutral; clear smooth boundary.

B22t—14 to 23 inches; dark gray (10YR 4/1) clay, very dark grayish brown (10YR 3/2) moist; weak coarse blocky structure parting to weak medium and fine blocky; extremely hard, extremely firm, very sticky and very plastic; mildly alkaline; clear smooth boundary.

B3—23 to 31 inches; dark gray (10YR 4/1) clay, very dark grayish brown (10YR 3/2) moist; weak coarse blocky structure; extremely hard, extremely firm, very sticky and very plastic; mildly alkaline; gradual wavy boundary.

C1—31 to 48 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; massive; extremely hard, extremely firm, very sticky and very plastic; few fine segrega-

Figure 13.—An area of Schamber-Murdo complex, 15 to 40 percent slopes.

tions of lime; slight effervescence; moderately alkaline; abrupt wavy boundary.

C2—48 to 60 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; massive; extremely hard, extremely firm, very sticky and very plastic; few fine segregations of lime; slight effervescence; moderately alkaline.

Free carbonates are at a depth of 30 to 50 inches. The A horizon is dark gray to grayish brown. The A1 horizon is 2 to 7 inches thick, and the A2 horizon is 1 to 3 inches thick. The B horizon is dark gray to grayish brown clay or silty clay. The B2t horizon is 16 to 22 inches thick, and the B3 horizon is 8 to 14 inches thick. The C horizon is gray to very pale brown clay, silty clay, or silty clay loam.

Scott soils in Tripp County have a darker colored A2 horizon and are more clayey in the C horizon than is defined as the range for the series, but these differences do not alter their usefulness and behavior.

Scott soils are near Onita and Reliance soils and are similar to Kolls soils. They are less clayey in the B horizon than Kolls soils. Scott soils are more poorly drained and generally are more clayey in the B horizon than Onita and Reliance soils.

So—Scott silt loam (0 to 1 percent slopes). This soil is in closed depressions. Areas are circular to oval in shape and are 5 to 30 acres in size.

Included with this soil in mapping are small areas of Mosher and Onita soils. These soils are near the edges of the mapped areas.

Runoff is ponded and the soil remains wet until the ponded water evaporates. This soil takes in water very slowly. Wetness commonly delays planting in spring. In some years crops are drowned by ponded water. Wetness is the main concern in management. Drainage improvement generally is not feasible.

Most areas of this soil are in native grass and are used for hay. Where farmed, they are used the same as surrounding soils. Alfalfa, corn, sorghum, and wheat are the main crops in these areas. Capability unit IVw–1; Closed Depression range site.

Shena series

The Shena series consists of shallow, nearly level to moderately sloping, well drained, silty soils on uplands. These soils formed in material weathered from underlying siltstone. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is dark gray silt loam about 5 inches thick. The subsoil, about 7 inches thick, is dark grayish brown and brown silty clay loam that contains fragments of siltstone. White and very pale brown siltstone is at a depth of 12 inches.

Shena soils are medium in fertility and moderate in content of organic matter. Permeability is moderately slow above the siltstone. Available water capacity is very low.

Nearly all areas of these soils remain in native grass and are used for grazing. A few areas are farmed in places where Shena soils are surrounded by deeper soils.

Representative profile of Shena silt loam, 0 to 9 percent slopes, in native grass, 120 feet north and 2,360 feet west of the southeast corner of sec. 10, T. 95 N., R. 78 W.:

A1—0 to 5 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; moderate fine granular structure; slightly hard, very friable; neutral; clear smooth boundary.

B21t—5 to 9 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and plastic; few fine fragments of siltstone; neutral; clear wavy boundary.

B22t—9 to 12 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; hard, firm, slightly sticky and plastic; many siltstone fragments 2 to 15 millimeters in diameter; mildly alkaline; clear wavy boundary.

Cr1—12 to 21 inches; white (10YR 8/2) siltstone bedrock, light yellowish brown (10YR 6/4) moist; moderately cemented; brown (10YR 5/3) coatings along rock cleavages; mildly alkaline; clear wavy boundary.

Cr2—21 to 60 inches; very pale brown (10YR 8/3) siltstone bedrock, light yellowish brown (10YR 6/4) moist; moderately cemented; mildly alkaline.

Siltstone bedrock is at a depth of 8 to 17 inches. The A horizon is dark gray to grayish brown and in places is silty clay loam. It is 3 to 5 inches thick. The B2t horizon is silty clay loam or silty clay and is 5 to 12 inches thick. The Cr horizon is white, light gray, or very pale brown in hue of 10YR or 7.5YR and is moderately cemented to strongly cemented.

Shena soils are near Epping, Huggins, Kadoka, Wanblee, and Wortman soils. They are more clayey than Epping soils. Shena soils are shallower to siltstone than Huggins and Kadoka soils, and are more clayey in the B horizon than Kadoka soils. They contain less sodium in the B and C horizons than Wanblee and Wortman soils.

SsB—Shena silt loam, 0 to 9 percent slopes. Areas of this nearly level to moderately sloping soil are irregular in shape and are 40 to more than 100 acres in size. Slopes are slightly convex.

Included with this soil in mapping are small areas of Epping, Huggins, Wanblee, and Wortman soils. Epping soils are on some of the ridges or on the shoulders of drainageways. Huggins soils are intermingled with the Shena soil. Wanblee and Wortman soils are on foot slopes and in shallow swales. Gumbo or scabby spots are on the Wanblee soil and are shown on the soil map by a spot symbol.

Runoff is medium. The hazard of water erosion is severe if an adequate plant cover is not maintained. This soil is too droughty and too shallow for cultivation. Controlling water erosion and conserving moisture are the main concerns in management.

Nearly all areas of this soil remain in native grass and are used for grazing. Capability unit VIe–11; Clayey range site.

Swanboy series

The Swanboy series consists of deep, nearly level to gently sloping, well drained, clayey soils on foot slopes and in fans along drainageways. These soils formed in clayey alluvium. The native vegetation is mainly a sparse stand of mid grasses.

In a representative profile the surface layer is gray clay about 2 inches thick. The subsoil is grayish brown clay about 16 inches thick. The underlying material is grayish brown, calcareous clay. Nests of salt crystals are in the lower part of the subsoil and in the underlying material.

Swanboy soils are low in fertility and moderately low in content of organic matter. Permeability is very slow, and available water capacity is low.

All areas of these soils remain in native grass and are used for grazing.

Representative profile of Swanboy clay, in native grass, 600 feet south and 800 feet east of the northwest corner of sec. 6, T. 102 N., R. 77 W.:

A1—0 to 2 inches; gray (10YR 5/1) clay, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure parting to moderate medium granular; hard, very firm, very sticky and very plastic; mildly alkaline; clear smooth boundary.

B21—2 to 12 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak very coarse subangular blocky structure parting to moderate medium blocky; extremely hard, extremely firm, very sticky and very plastic; moderately alkaline; gradual smooth boundary.

B22—12 to 18 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse blocky structure parting to moderate fine blocky; extremely hard, extremely firm, very sticky and very plastic; few fine nests of salt crystals; moderately alkaline; abrupt wavy boundary.

C—18 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, extremely firm, very sticky and very plastic; few medium nests of salt crystals; slight effervescence; moderately alkaline.

Colors range in hue from 5Y to 10YR and correspond to the parent material. The A horizon is gray to light brownish gray and in places is silty clay. It is 1 inch to 2 inches thick. The B horizon is gray, grayish brown, or light brownish gray and is 12 to 20 inches thick. It is mildly alkaline to strongly alkaline. Nests of salt crystals are few to many in the B and C horizons. The C horizon is grayish brown or light brownish gray. In places bedded shale is at a depth of 40 to 60 inches.

Swanboy soils have a thinner A horizon and contain salts at a shallower depth than the nearby Opal and Promise soils. They also are deeper to shale than Opal soils.

Sw—Swanboy clay (0 to 6 percent slopes). This nearly level to gently sloping soil is on foot slopes and fans along drainageways and on the edge of the White River valley. Areas are irregular in shape and are 50 to more than 200 acres in size. Slopes are slightly concave to slightly convex. Active gullies are in some mapped areas. In places salts are at or near the surface.

Included with this soil in mapping are small areas of Promise soils. These soils are on low terraces adjacent to and generally slightly below this Swanboy soil. Small wet spots are in some mapped areas and are shown on the soil map by a spot symbol.

Runoff is slow to rapid, depending on the slope. This soil takes in water very slowly and has very poor tilth. It is not suited to cultivated crops.

All areas of this soil remain in native grass and are used for grazing. Vegetation is sparse and saline spots are bare. Capability unit VIs–5; Dense Clay range site.

Tassel series

The Tassel series consists of shallow, nearly level to steep, well drained, loamy soils on uplands. These soils formed in material weathered from underlying sandstone (fig. 14). The native vegetation is mainly short and mid grasses.

In a representative profile the surface layer is dark grayish brown and grayish brown, calcareous fine sandy loam about 7 inches thick. The underlying material to a depth of 14 inches is light gray, calcareous fine sandy loam. Light gray, calcareous sandstone is at a depth of 14 inches.

Tassel soils are low in fertility and in content of organic matter. Permeability is moderately rapid above the sandstone. Available water capacity is very low.

Nearly all areas of these soils remain in native grass and are used for grazing.

Representative profile of Tassel fine sandy loam in an area of Anselmo-Tassel fine sandy loams, 10 to 20 percent slopes, in native grass, 65 feet south and 1,500 feet east of the northwest corner of sec. 31, T. 97 N., R. 78 W.:

A11—0 to 3 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable; slight effervescence; mildly alkaline; clear smooth boundary.

A12—3 to 7 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium blocky structure; soft, very friable; strong effervescence; mildly alkaline; clear smooth boundary.

C—7 to 14 inches; light gray (10YR 7/1) fine sandy loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; strong effervescence; mildly alkaline; clear smooth boundary.

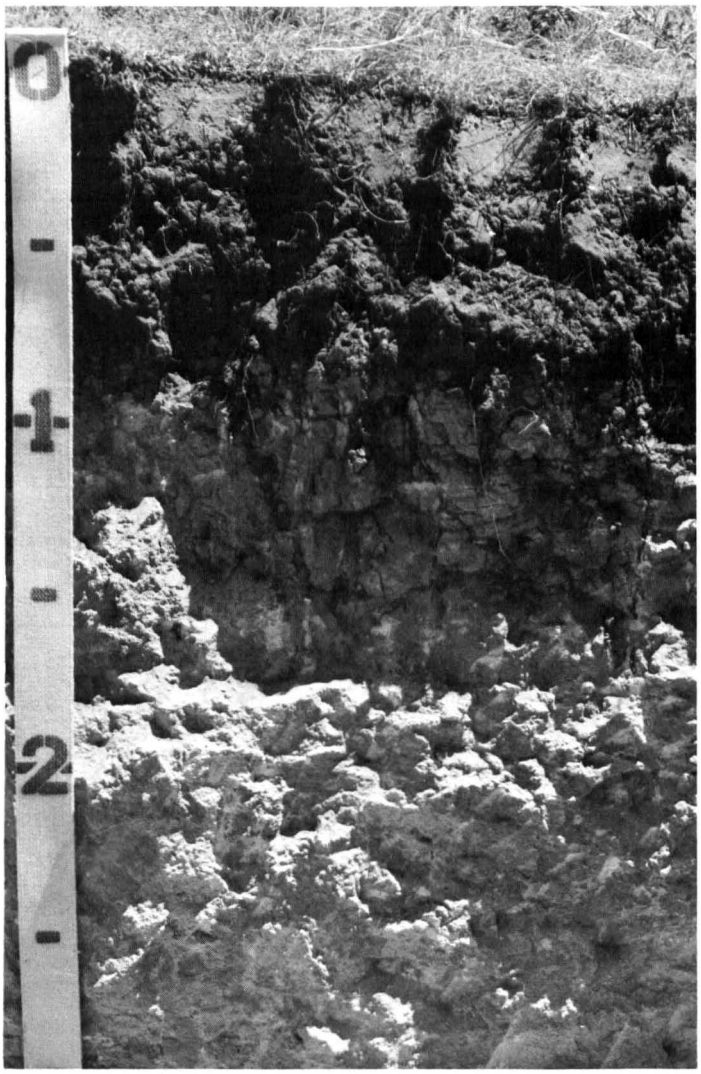

Figure 14.—**This profile of Tassel fine sandy loam, 9 to 40 percent slopes, formed in soft, weakly cemented, calcareous sandstone.**

Cr—14 to 60 inches; light gray (10YR 7/2) sandstone, grayish brown (10YR 5/2) moist; weakly cemented; violent effervescence; mildly alkaline.

Sandstone is at a depth of 10 to 20 inches. Free carbonates are at a depth of 7 inches or less. The A horizon is dark grayish brown to light brownish gray and in places is loamy fine sand. It is 3 to 8 inches thick. The C horizon is light brownish gray or light gray and in places is loamy fine sand. It commonly contains fragments of sandstone that in places make up 25 percent of the horizon by volume. The sandstone in the Cr horizon is light gray.

Tassel soils are mapped with or near Anselmo, Dunday, Holt, Ronson, and Valentine soils and are similar to Canyon and Epping soils. They are shallower to sandstone than Anselmo, Dunday, Holt, Ronson, and Valentine soils. Tassel soils contain more sand than Canyon and Epping soils.

TaE—Tassel fine sandy loam, 9 to 40 percent slopes. This strongly sloping to steep soil is on the sides of ridges, buttes, and entrenched drainageways. Areas are irregular in shape and are 75 to more than 300 acres in size.

Included with this soil in mapping are small areas of Anselmo, Ronson, and Vetal soils. Anselmo and Vetal soils are on foot slopes and in swales. Ronson soils generally are near and immediately below the Tassel soil. Also included in some mapped areas are small areas of Rock outcrop in the higher part of the landscape.

Runoff is medium to rapid. This soil is droughty. It is subject to soil blowing and water erosion if the plant cover is disturbed. It is not suited to cultivated crops. Controlling soil blowing and water erosion is the main concern in management.

All areas in this soil remain in native grass and are used for grazing. Capability unit VIIe–4; Shallow range site.

TrF—Tassel-Rock outcrop complex, 15 to 40 percent slopes. This complex of moderately steep to steep soils is on the sides of canyons and buttes. Areas generally are long and narrow. They are 75 to 300 acres in size. This complex is about 50 percent Tassel soil, 25 percent Rock outcrop, and 25 percent other soils. Rock outcrop is mostly on the higher part of the landscape. It consists of ledges of sandstone that are the rims of canyons and buttes.

Included with this complex in mapping are small areas of Anselmo, Doger, Ronson, and Vetal soils. Anselmo and Doger soils are on the lower part of the landscape. Ronson soils are intermingled with Tassel soils. Vetal soils are in swales.

Runoff is medium to rapid. The Tassel soil is droughty and is subject to water erosion and soil blowing. This complex is not suited to cultivated crops.

All areas of this complex are in native grass and are used for grazing. Tassel part in capability unit VIIe–4, Shallow range site; Rock outcrop part in capability unit VIIIs–1, not placed in a range site.

Valentine series

The Valentine series consists of deep, undulating to rolling, excessively drained, sandy soils on uplands. These soils formed in eolian sand. The native vegetation is mainly tall and mid grasses.

In a representative profile the surface layer is grayish brown fine sand about 5 inches thick. Below this is a transitional layer of pale brown fine sand about 7 inches thick. The underlying material is loose fine sand. It is pale brown to a depth of 40 inches and very pale brown below.

Valentine soils are low in fertility and in content of organic matter. Permeability is rapid, and available water capacity is low.

Nearly all areas of these soils remain in native grass and are used for grazing. Some of the less sloping areas are used for hay.

Representative profile of Valentine fine sand, 6 to 15 percent slopes, in native grass, 220 feet west and 1,135 feet south of the northeast corner of sec. 36, T. 97 N., R. 77 W.:

A1—0 to 5 inches; grayish brown (10YR 5/2)

fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; loose; slightly acid; clear smooth boundary.

AC—5 to 12 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; weak coarse subangular blocky structure parting to single grained; loose; slightly acid; clear smooth boundary.

C1—12 to 40 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grained; loose; slightly acid; gradual wavy boundary.

C2—40 to 60 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; single grained; loose; slightly acid.

Reaction is slightly acid or neutral throughout. The A horizon is dark grayish brown to light brownish gray and is loamy fine sand or fine sand. It is 3 to 8 inches thick. The AC horizon is grayish brown or light brownish gray and in places is loamy fine sand. It is 3 to 8 inches thick. The C horizon is light brownish gray to very pale brown.

Valentine soils are mapped with or near Doger, Dunday, Elsmere, Tassel, and Ronson soils. They have a thinner A horizon than Doger and Dunday soils and are better drained than Elsmere soils. Valentine soils are deeper to sandstone and are more sandy than Ronson and Tassel soils.

VaD—Valentine fine sand, 6 to 15 percent slopes. Areas of these gently rolling to rolling soils are irregular in shape and are 50 to more than 500 acres in size. Slopes are short and convex. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Doger, Dunday, and Tassel soils. Doger soils are in low areas. Dunday soils are on the concave, lower sides of knolls and ridges. Tassel soils are on some of the high knobs and ridges. Small wet spots, sand blowouts, and outcrops of sandstone are in some mapped areas and are shown on the soil map by spot symbols.

Runoff is very slow, and most of the rainfall enters the soil. This soil is subject to severe soil blowing and is not suited to cultivated crops. Controlling soil blowing is the main concern in management.

All areas of this soil remain in native grass and are used for grazing. Capability unit VIe–7; Sands range site.

VdC—Valentine-Dunday complex, 3 to 9 percent slopes. Areas of this complex of undulating to gently rolling soils are irregular in shape and are 50 to more than 500 acres in size. This complex is about 50 percent Valentine soil, 40 percent Dunday soil, and 10 percent other soils. Slopes are short and convex (fig. 15). The Valentine soil is on convex knolls and ridges, and the Dunday soil is on the lower part of the landscape. The Valentine soil has a surface layer of fine sand or loamy fine sand. The Dunday soil has the profile described as representative of the Dunday series.

Included with these soils in mapping are small areas of Doger and Tassel soils. Doger soils are in swales and Tassel soils are on some of the higher undulations. Small wet spots in low areas, sand blowouts, and outcrops of sandstone are in some mapped areas and are shown on the soil map by spot symbols.

Runoff is slow or very slow, and most of the rainfall enters the soil. These soils are subject to severe soil blowing and are too sandy for continuous cultivation. Controlling soil blowing is the main concern in management.

Most areas of this complex remain in native grass

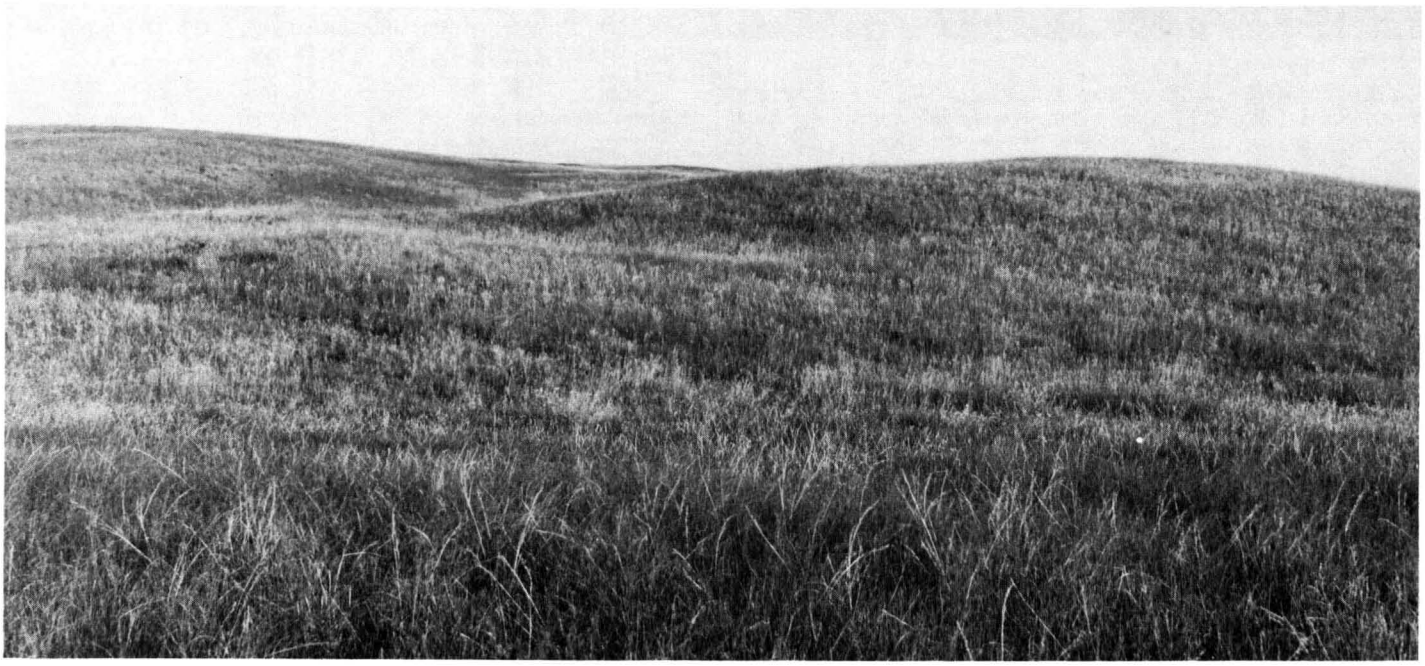

Figure 15.—**An area of Valentine-Dunday complex, 3 to 9 percent slopes.**

and are used for grazing and hay. Alfalfa is grown in some areas. Capability unit VIe–7; Sands range site.

VnD—Valentine-Tassel complex, 6 to 15 percent slopes. Areas of this complex of gently rolling to rolling soils are irregular in shape and are 50 to more than 300 acres in size. This complex is 60 percent Valentine soil, 20 percent Tassel soil, and 20 percent other soils. Slopes are short and convex. The Valentine soil is on the sides of ridges and knolls. It has a surface layer of fine sand or loamy fine sand. The Tassel soil is on the higher part of the landscape on ridges and peaks. It has a surface layer of fine sandy loam or loamy fine sand.

Included with these soils in mapping are small areas of Doger and Dunday soils. Doger and Dunday soils are on foot slopes and in swales. Also included in some mapped areas are small areas of Rock outcrop on some of the peaks and ridges. Sand blowouts are also in some mapped areas and are shown on the soil map by a spot symbol.

Runoff is very slow on the Valentine soils and is medium on the Tassel soils. These soils are subject to severe soil blowing if the plant cover is disturbed. They are too sandy for cultivated crops. Controlling soil blowing is the main concern in management.

All areas of this complex remain in native grass and are used for grazing. Capability unit VIe–7; Valentine part in Sands range site, Tassel part in Shallow range site.

Vetal series

The Vetal series consists of deep, nearly level, well drained loamy soils in swales on uplands. These soils formed in local alluvium washed in from adjacent soils. The native vegetation is mainly tall and mid grasses.

In a representative profile (fig. 16) the surface layer is dark grayish brown fine sandy loam about 17 inches thick. Below this is a transitional layer of grayish brown fine sandy loam about 18 inches thick. The underlying material is loamy fine sand that is brown to a depth of 48 inches and pale brown below.

Vetal soils are high in fertility and in content of organic matter. Permeability is moderately rapid, and available water capacity is moderate.

Most areas of these soils are in cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Vetal fine sandy loam, in native grass, 1,000 feet south and 150 feet west of the northeast corner of sec. 30, T. 97 N., R. 76 W.:

A11—0 to 4 inches; dark grayish brown (10YR 4/2) fine sandy loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; neutral; abrupt smooth boundary.

A12—4 to 17 inches; dark grayish brown (10YR 4/2) fine sandy loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure; soft, very friable; neutral; clear smooth boundary.

AC—17 to 35 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

C1—35 to 48 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable; neutral; gradual smooth boundary.

C2—48 to 60 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grained; loose; neutral.

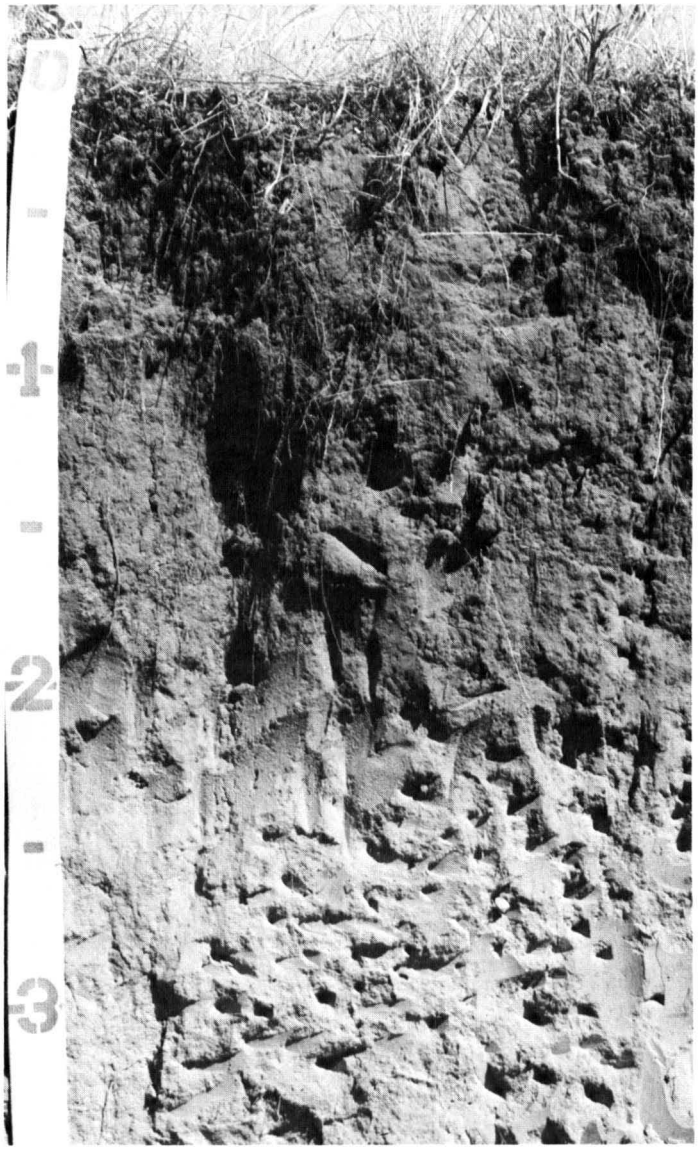

Figure 16.—**Profile of Vetal fine sandy loam.**

Reaction in all horizons is neutral or mildly alkaline. The A horizon is dark grayish brown or grayish brown and is 14 to 25 inches thick. The AC horizon is grayish brown or dark grayish brown and is 10 to 20 inches thick. The C horizon is grayish brown to very pale brown fine sandy loam, loamy fine sand, or fine sand. In places the lower part is calcareous.

Vetal soils are near Anselmo, Chappell, Dix, Doger, Elsmere, Holt, Manter, Ronson, Wann, and Whitelake

soils. They have a thicker A horizon than Anselmo, Chappell, Dix, Holt, Manter, and Ronson soils, and a less gravelly C horizon than Chappell and Dix soils. Vetal soils are deeper to sandstone than Holt and Ronson soils. They are less sandy than Doger soils, and they are better drained than Elsmere and Wann soils. They contain less sodium than Whitelake soils.

Vt—Vetal fine sandy loam (0 to 2 percent slopes). Areas of this nearly level soil are long and narrow. They are 20 to 100 acres in size. Slopes are slightly concave. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Anselmo, Doger, and Whitelake soils. Anselmo and Doger soils are on slight rises. Whitelake soils are near the edges of some mapped areas. Small wet spots and gumbo or scabby spots are in some mapped areas and are shown on the soil map by spot symbols.

Runoff is slow, and most of the rainfall enters the soil. In some years this soil receives additional moisture in the form of runoff from adjacent soils. This soil is easy to work, but it is subject to soil blowing. Controlling soil blowing is the main concern in management.

Most areas of this soil are in cultivated crops, mainly alfalfa, corn, and oats. Areas in native grass are used for grazing and hay. Capability unit IIIe–7; Sandy range site.

Wanblee series

The Wanblee series consists of moderately deep, nearly level, somewhat poorly drained, silty soils that have a claypan subsoil. These soils are on terraces and in upland basins. They formed in material weathered from underlying siltstone. The native vegetation is mainly sparse stands of short and mid grasses.

In a representative profile the surface layer is gray silt loam about 2 inches thick. The subsoil is clay loam about 6 inches thick; it is dark grayish brown in the upper part, brown in the middle part, and pale brown and calcareous in the lower part. The underlying material to a depth of 20 inches is light gray, calcareous loam. Light gray, calcareous siltstone is at a depth of 20 inches. It is strongly alkaline.

Wanblee soils are low in fertility and in content of organic matter. Permeability is very slow, and available water capacity is very low.

All areas of these soils remain in native grass and are used for grazing.

Representative profile of Wanblee silt loam in an area of Wanblee-Wortman silt loams, in native grass, 70 feet west and 650 feet north of the southeast corner of sec. 28, T. 96 N., R. 79 W.:

A2—0 to 2 inches; gray (10YR 5/1) silt loam, very dark grayish brown (10YR 3/2) moist; weak thick platy structure parting to weak thin platy; soft, very friable; neutral; abrupt smooth boundary.

B21t—2 to 4 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium columnar structure; extremely hard, extremely firm, sticky and plastic; mildly alkaline; clear smooth boundary.

B22t—4 to 6 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; weak medium blocky structure parting to moderate fine blocky; hard, firm, sticky and plastic; few fine fragments of siltstone; mildly alkaline; clear smooth boundary.

B3—6 to 8 inches; pale brown (10YR 6/3) light clay loam, dark brown (10YR 4/3) moist; weak medium blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine fragments of siltstone; slight effervescence; moderately alkaline; clear wavy boundary.

C—8 to 20 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky; common fine fragments of siltstone; strong effervescence; moderately alkaline; clear wavy boundary.

Cr—20 to 60 inches; light gray (10YR 7/2) soft siltstone, pale brown (10YR 6/3) moist; strong effervescence; strongly alkaline.

Siltstone is at a depth of 20 to 40 inches. Content of exchangeable sodium exceeds 15 percent in some part of the B or C horizons. The A2 horizon is silt loam or loam and is 1 to 4 inches thick. The B2t horizon is clay loam or clay and is 3 to 6 inches thick. The B3 horizon is brown or pale brown and in places is loam. It is 2 to 4 inches thick. The C horizon is light brownish gray to pink in hue of 10YR or 7.5YR and in places is clay loam. It has few to many fragments of siltstone. The siltstone in the Cr horizon is weakly cemented to strongly cemented.

Wanblee soils are mapped with or near Huggins, Kadoka, and Wortman soils and are similar to Hurley, Jerauld, and Lute soils. Wanblee soils have columnar structure in the B horizon and contain more sodium than Huggins and Kadoka soils. They are less clayey in the B horizon than Hurley soils, and they are dark in color to a shallower depth than Jerauld, Lute, and Wortman soils. In addition, Wanblee soils are more clayey in the B horizon than Lute soils and have a thinner A horizon than Wortman soils.

Wa—Wanblee-Wortman silt loams (0 to 2 percent slopes). Areas of this complex of nearly level soils are irregular in shape and are 50 to more than 150 acres in size. This complex is about 50 percent Wanblee soil, 35 percent Wortman soil, and 15 percent other soils. The surface is uneven because of many small mounds that rise several inches above the intervening low spots or small depressions. The Wanblee soil is in the low areas. The Wortman soil is on the mounds.

Included with these soils in mapping are small areas of Huggins and Kadoka soils on some of the mounds and on the edges of mapped areas.

Runoff is slow and ponds on the Wanblee soil in spring and after heavy rains. These soils take in water slowly and release moisture slowly to plants. Tilth of the Wanblee soil is poor.

All areas of this complex remain in native grass and are used for grazing. Some low spots are bare of vegetation. The Wanblee soil is not suited to cultivated crops. The Wortman soil is suited to cultivated crops, but in most areas it is so closely intermingled with the

Wanblee soil that cultivation is not practical. Wanblee part in capability unit VIs–1, Thin Claypan range site; Wortman part in capability unit IVs–2, Claypan range site.

Wann series

The Wann series consists of deep, nearly level, somewhat poorly drained, loamy soils on bottom lands. These soils formed in sandy alluvium. The native vegetation is mainly tall grasses.

In a representative profile the surface layer is dark grayish brown and grayish brown fine sandy loam about 20 inches thick. The underlying material to a depth of 38 inches is calcareous sandy loam that is brown in the upper part and light brownish gray in the lower part. The next layer is light brownish gray, calcareous loamy fine sand. Light brownish gray, calcareous fine sandy loam is at a depth of 50 inches.

Wann soils are medium in fertility and moderate in content of organic matter. Permeability is moderately rapid, and available water capacity is moderate. Areas of these soils are subject to flooding. Depth to the seasonal water table is 2 to 6 feet.

About half of the acreage is in cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Wann fine sandy loam, in native grass, 400 feet west and 500 feet south of the center of sec. 29, T. 96 N., R. 77 W.:

A11—0 to 2 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

A12—2 to 6 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable; neutral; clear smooth boundary.

A13—6 to 20 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable; mildly alkaline; abrupt wavy boundary.

C1—20 to 28 inches; brown (10YR 5/3) sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable; few fine segregations of lime; slight effervescence; moderately alkaline; clear wavy boundary.

C2—28 to 38 inches; light brownish gray (10YR 6/2) sandy loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; common fine stains of dark yellowish brown (10YR 4/4); slight effervescence; mildly alkaline; clear wavy boundary.

C3—38 to 50 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) moist; single grained; loose; common fine stains of dark yellowish brown (10YR 4/4); slight effervescence; mildly alkaline; clear wavy boundary.

C4g—50 to 60 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable; few fine dark yellowish brown iron stains; slight effervescence; mildly alkaline.

Free carbonates commonly are at a depth of 20 inches or more, but some pedons that have a silt loam A horizon are calcareous at the surface. The A horizon is dark gray to grayish brown and is sandy loam to silt loam. It is 12 to 20 inches thick. The C horizon is grayish brown to pale brown.

Wann soils in Tripp County contain less free carbonates than is defined as the range for the series. They also lack mottles in the C1 horizon. These differences, however, do not alter their usefulness or behavior.

Wann soils are near Anselmo, Cass, Doger, Orwet, Vetal, and Whitelake soils. They are more poorly drained than Anselmo, Cass, Doger, and Vetal soils. Wann soils are better drained and less calcareous than Orwet soils. They contain less sodium than Whitelake soils.

Wb—Wann fine sandy loam (0 to 2 percent slopes). This nearly level soil is on bottom lands along some of the larger streams in the southern part of the survey area. Most areas are long and narrow. Slight undulations and meander scars are in some areas. In a few places the surface layer is silt loam.

Included in mapping are small areas of Doger, Orwet, and Vetal soils. Doger soils are on some of the undulations. Orwet soils are in some of the low-lying areas. Vetal soils are in swales near the edge of the stream valleys. Gumbo or scabby spots are in some mapped areas and are shown on the soil map by a spot symbol.

Runoff is slow. This soil is subject to flooding from runoff in spring and after heavy rains. During wet years the high water table limits use. This soil is subject to soil blowing. Controlling wetness from flooding or from the water table and controlling soil blowing are the main concerns in management.

About half of the acreage is in cultivated crops, mainly alfalfa, corn, and oats. Areas in native grass are used for grazing and hay. Capability unit IIIw–5; Subirrigated range site.

Westover series

The Westover series consists of deep, strongly sloping to moderately steep, well drained, loamy soils on terrace escarpments. These soils formed in alluvium. The native vegetation is mainly mid and short grasses.

In a representative profile the surface layer is brown loam about 4 inches thick. Below this is a transitional layer of pale brown loam about 8 inches thick. The underlying material to a depth of 38 inches is brown loam and fine sandy loam. Sand and gravel is at a depth of 32 inches. The entire profile is calcareous.

Westover soils are low in fertility and in content of organic matter. Permeability is moderate in the upper 32 inches and rapid in the sand and gravel. Available water capacity is moderate.

All areas of these soils remain in native grass and are used for grazing.

Representative profile of Westover loam, 9 to 25 percent slopes, in native grass, 2,700 feet east and 750 feet north of the southwest corner of sec. 36, T. 103 N., R. 78 W.:

A1—0 to 4 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, very friable; slight effervescence; mildly alkaline; clear smooth boundary.

AC—4 to 12 inches; pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; slightly hard, very friable; strong effervescence; mildly alkaline; clear wavy boundary.

C1—12 to 24 inches; pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable; strong effervescence; mildly alkaline; clear wavy boundary.

C2—24 to 32 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; strong effervescence; mildly alkaline; clear wavy boundary.

IIC3—32 to 60 inches; brown (10YR 5/3), yellowish brown (10YR 5/4), pale brown (10YR 6/3), and light yellowish brown (10YR 6/4) sand and gravel, dark brown (10YR 4/3), dark yellowish brown (10YR 4/4), brown (10YR 5/3), and yellowish brown (10YR 5/4) moist; single grained; loose; few fine shale chips; slight effervescence; mildly alkaline.

Free carbonates are at the surface in most places, but in other places the A1 horizon is noncalcareous. Depth to the coarser underlying material is 24 to 48 inches. The A horizon is dark grayish brown to brown and is loam, silt loam, or very fine sandy loam. It is 3 to 5 inches thick. The AC horizon is grayish brown to pale brown loam or silt loam. It is 5 to 12 inches thick. The C horizon is grayish brown to very pale brown. The C1 and C2 horizons are loam, fine sandy loam, or very fine sandy loam. The IIC horizon has various colors and is loamy sand or sand and gravel. It is highly stratified and commonly has thin layers of loam or shale chips.

Westover soils are near Canning, Lowry, Murdo, Opal, Sansarc, and Schamber soils. They are less clayey in the upper horizon than Canning soils and are less silty than Lowry soils. Westover soils are deeper to gravelly material than Murdo and Schamber soils. They are less clayey than Opal and Sansarc soils.

WeE—Westover loam, 9 to 25 percent slopes. This strongly sloping to moderately steep soil is on terrace escarpments. Most areas are long and narrow. They range from 50 to 150 acres in size.

Included with this soil in mapping are small areas of Canning, Opal, Sansarc, and Schamber soils. Canning and Schamber soils are on the higher part of the landscape on narrow ridgetops. Opal and Sansarc soils are on the lower part of the landscape. Gravel pits are in some areas and are shown on the soil map by a spot symbol.

Runoff is rapid. The hazard of erosion is severe if the plant cover is removed. Controlling water erosion is the main concern in management.

All areas of this soil remain in native grass and are used for grazing. Capability unit VIe–3; Thin Upland range site.

Wewela series

The Wewela series consists of moderately deep, nearly level to gently sloping, well drained, loamy soils on uplands. These soils formed in eolian loamy material overlying clayey shale. The native vegetation is mainly mid and tall grasses.

In a representative profile the surface layer is grayish brown fine sandy loam about 8 inches thick. The subsoil is about 10 inches thick; it is light olive brown sandy clay loam in the upper part and light brownish gray and olive yellow clay in the lower part. The underlying material to a depth of 26 inches is light brownish gray and olive yellow shaly clay. Light brownish gray and olive yellow shale is at a depth of 26 inches.

Wewela soils are medium in fertility and moderate in content of organic matter. Permeability is moderate to a depth of about 13 inches and is slow or very slow below. Available water capacity is low or very low.

About half of the acreage is used for farming. Areas in native grass are used for grazing and hay.

Representative profile of Wewela fine sandy loam, 3 to 6 percent slopes, in cultivation, 1,850 feet south and 132 feet east of the northwest corner of sec. 29, T. 96 N., R. 76 W.:

Ap—0 to 4 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure parting to moderate medium granular; hard, very friable; neutral; abrupt smooth boundary.

A12—4 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse and medium subangular blocky structure; hard, very friable; neutral; clear smooth boundary.

B2t—8 to 13 inches; light olive brown (2.5Y 5/4) sandy clay loam, olive brown (2.5Y 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm; coatings of grayish brown on faces of peds; neutral; gradual wavy boundary.

IIB3—13 to 18 inches; light brownish gray (2.5Y 6/2) and olive yellow (2.5Y 6/6) clay, grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/8) moist; moderate coarse blocky structure; hard, firm; tongues of A horizon material in vertical cracks; neutral; gradual wavy boundary.

IIC—18 to 26 inches; light brownish gray (2.5Y

6/2) and olive yellow (2.5Y 6/6) shaly clay, grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/8) moist; massive; hard, firm; neutral; gradual wavy boundary.

IICr—26 to 60 inches; light brownish gray (2.5Y 6/2) and olive yellow (2.5Y 6/6) shale, grayish brown (10YR 5/8) moist; platy bedrock structure; shale plates brittle when dry; few segregations of lime; strong effervescence on surface of shale plates, interior does not effervesce; mildly alkaline.

Shale is at a depth of 20 to 40 inches. Free carbonates are at a depth of 18 to 30 inches. Reaction is slightly acid or neutral in the A and B horizons and neutral to moderately alkaline in the IIC horizon. The A horizon is dark gray to grayish brown and is fine sandy loam or loamy fine sand. It is 7 to 10 inches thick. The B2t horizon is grayish brown to light yellowish brown in hue of 10YR or 2.5Y and in places is clay loam or heavy loam. It is 3 to 7 inches thick. The IIB3 horizon is grayish brown to olive yellow in hue of 10YR or 2.5Y and is 4 to 6 inches thick. The IIC horizon is grayish brown to olive yellow in hue of 10YR, 2.5Y, or 5Y.

Wewela soils are near Anselmo, Boyd, Doger, Lakoma, Manter, and Vetal soils. They are more clayey in the B horizon than Anselmo, Doger, Manter, and Vetal soils and are underlain by shale at a moderate depth. Wewela soils are more sandy than Boyd and Lakoma soils.

WfA—Wewela loamy fine sand, 0 to 4 percent slopes. This gently undulating soil is on uplands. Areas are irregular in shape and are 50 to more than 200 acres in size. Slopes are short and convex.

Included with this soil in mapping are small areas of Doger and Whitelake soils. Doger soils are scattered throughout the mapped areas. Whitelake soils are in low areas.

Runoff is slow, and most of the rainfall enters the soil. This soil is easy to work, but it is subject to soil blowing. Controlling soil blowing is the main concern in management.

About half of the acreage is in cultivated crops, mainly alfalfa, corn, and small grain. Areas in native grass are used for grazing and hay. Capability unit IVe–9; Sandy range site.

WgA—Wewela fine sandy loam, 0 to 3 percent slopes. Areas of this nearly level to very gently sloping soil are irregular in shape and are 50 to 200 acres in size. Slopes are plane to slightly convex. Parts of some mapped areas have a surface layer of loamy fine sand.

Included with this soil in mapping are small areas of Manter, Vetal, and Whitelake soils. Manter soils are closely intermingled with the Wewela soil. Vetal and Whitelake soils are in swales and low areas. Small wet spots are in some low areas and are shown on the soil map by a spot symbol.

Runoff is slow, and most of the rainfall enters the soil. This soil is easy to work, but it is subject to soil blowing. Controlling soil blowing is the main concern in management.

Most areas of this soil are in cultivated crops, mainly alfalfa, corn, and small grain. Areas in native grass are used for grazing and hay. Capability unit IIIe–9; Sandy range site.

WgB—Wewela fine sandy loam, 3 to 6 percent slopes. Areas of this gently sloping soil are irregular in shape and are 30 to more than 200 acres in size. Slopes are mostly convex. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Lakoma, Manter, and Vetal soils. Lakoma soils are on some of the convex ridgetops. Manter soils are on foot slopes. Vetal soils are in swales. Small gravelly areas are on some of the ridges and are shown on the soil map by a spot symbol.

Runoff is slow to medium. This soil is subject to soil blowing, and when farmed it has a moderate hazard of water erosion. Controlling soil blowing and water erosion is the main concern in management.

About half of the acreage is farmed. Alfalfa, corn, and small grain are the main crops. Areas in native grass are used for grazing and hay. Capability unit IIIe–10; Sandy range site.

Whitelake series

The Whitelake series consists of deep, nearly level, moderately well drained, loamy soils that have a claypan subsoil. These soils are in upland basins. They formed in sandy alluvium. The native vegetation is mainly mid and tall grasses.

In a representative profile the surface layer is dark grayish brown fine sandy loam about 11 inches thick. The subsurface layer, about 3 inches thick, is grayish brown loamy fine sand. The subsoil is about 19 inches thick. It is pale brown sandy clay loam in the upper part, pale brown fine sandy loam in the middle part, and very pale brown fine sandy loam in the lower part. It is very strongly alkaline. The underlying material is very pale brown and light gray loamy sand stratified with thin layers of silt and clay.

Whitelake soils are medium in fertility and moderate in content of organic matter. Permeability is slow, and available water capacity is low or moderate. These soils have a seasonal water table at a depth of 2 to 6 feet.

Most areas of these soils remain in native grass and are used for grazing and hay. Some areas are farmed.

Representative profile of Whitelake fine sandy loam in an area of Whitelake-Lute fine sandy loam, in native grass, 215 feet east and 1,410 feet north of the southwest corner of sec. 16, T. 97 N., R. 78 W.:

A11—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable; medium acid; clear smooth boundary.

A12—5 to 11 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure parting to weak fine granular; soft, very friable; medium acid; clear smooth boundary.

A2—11 to 14 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable;

mildly alkaline; clear smooth boundary.

B21t—14 to 19 inches; pale brown (10YR 6/3) sandy clay loam, dark brown (10YR 4/3) moist; strong very coarse columnar structure; extremely hard, firm, sticky and plastic; coatings of grayish brown (10YR 5/2) on tops of columns; organic coats of dark gray (10YR 4/1) on sides of columns and in root channels; few fine and medium segregations of lime; strong effervescence; very strongly alkaline; clear smooth boundary.

B22t—19 to 24 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; common medium faint mottles of gray; weak coarse prismatic structure parting to weak medium subangular blocky; very hard, friable, slightly sticky; few fine segregations of lime; strong effervescence; very strongly alkaline; gradual smooth boundary.

B3—24 to 33 inches; very pale brown (10YR 7/3) fine sandy loam with thin lenses of clay and silt, pale brown (10YR 6/3) moist; common medium faint mottles of gray; weak very coarse subangular blocky structure; very hard, very friable; few fine segregations of lime; strong effervescence; very strongly alkaline; abrupt wavy boundary.

C1ca—33 to 41 inches; very pale brown (10YR 7/3) loamy sand stratified with thin lenses of silt and clay, pale brown (10YR 6/3) moist; common medium faint mottles of gray; massive; very hard, very friable; common fine segregations of lime; strong effervescence; very strongly alkaline; abrupt wavy boundary.

C2—41 to 60 inches; light gray (2.5Y 7/2) loamy sand stratified with thin lenses of silt and clay, grayish brown (2.5Y 5/2) moist; massive; very hard, very friable; few fine segregations of lime; strong effervescence; strongly alkaline.

Free carbonates are at a depth of 10 to 34 inches. The A1 and A2 horizons are medium acid to mildly alkaline. The B and C horizons are moderately alkaline to very strongly alkaline. The A1 horizon is very dark gray to grayish brown and in places is loamy fine sand. It is 8 to 16 inches thick. The A2 horizon is gray to light brownish gray and in places is loamy fine sand. It is 2 to 4 inches thick. The B2t horizon is grayish brown to pale brown and is 7 to 12 inches thick. The B3 and C horizons are grayish brown to very pale brown. They are fine sandy loam to loamy sand and are 6 to 10 inches thick. The C horizon is loamy sand, sand, sandy loam, loam, silt loam, or fine sandy loam. It commonly is stratified with finer and coarser textures.

Whitelake soils are mapped with or near Anselmo, Doger, Elsmere, Holt, Lute, Manter, Vetal, and Wann soils. Whitelake soils are more poorly drained and contain more sodium than Anselmo, Doger, Elsmere, Holt, Manter, and Vetal soils. They are better drained and have a thicker A horizon than Lute soils. Whitelake soils are better drained and contain more sodium than Wann soils.

Wh—Whitelake fine sandy loam (0 to 2 percent slopes). This nearly level soil is in broad basins. Areas are irregular in shape and are 40 to more than 300 acres in size. In a few places the surface layer is loamy fine sand.

Included with soil in mapping are small areas of Anselmo, Doger, Elsmere, and Lute soils. Anselmo and Doger soils are on slight rises near the edges of the mapped areas. Elsmere soils are in the lower part of the landscape and along drainageways. Lute soils are in small low spots. Small wet spots are in some mapped areas and are shown on the soil map by a spot symbol.

Runoff is slow. This soil is subject to soil blowing. The claypan subsoil takes in water slowly and releases moisture slowly to plants. In some years wetness from the water table delays farming operations. Controlling soil blowing is the main concern in management.

Most areas of this soil remain in native grass and are used for grazing and hay. Alfalfa, corn, and oats are the main cultivated crops. Capability unit IVe–13; Sandy range site.

Wk—Whitelake-Lute fine sandy loams (0 to 2 percent slopes). This complex of nearly level soils is in upland basins. The surface is uneven because of many small mounds that are a few inches above small low spots or depressions. Areas are irregular in shape and are 20 to 150 acres in size. This complex is about 50 percent Whitelake soil, 30 percent Lute soil, and 20 percent other soils. The Whitelake soil is on the mounds. The Lute soil is in low spots. Both soils have the profiles described as representative of their respective series.

Included with these soils in mapping are small areas of Anselmo and Doger soils on slight rises which are mostly on the edges of the mapped areas. Small wet spots are in some mapped areas and are shown on the soil map by a spot symbol.

Runoff is slow and water briefly ponds on the Lute soil during wet seasons. The hazard of soil blowing is severe. In addition Lute soils are strongly alkaline in the upper few inches and are not suited to cultivated crops.

Most areas of this complex remain in native grass and are used for grazing. The Whitelake soils are suitable for cultivation, but in many areas the two soils are so closely intermingled that cultivation is not practical. Whitelake part in capability unit IVe–13, Sandy range site; Lute part in capability unit VIs–1; Saline Lowland range site.

Witten series

The Witten series consists of deep, nearly level, moderately well drained, clayey soils in swales on uplands. These soils formed in local alluvium washed in from adjacent soils. The native vegetation is mainly mid grasses.

In a representative profile the surface layer is grayish brown and dark grayish brown silty clay about 9 inches thick. The subsoil is clay about 32 inches thick; it is dark grayish brown in the upper part and grayish brown in the lower part. The underlying material is grayish brown clay. The entire profile is calcareous.

Witten soils are high in fertility and in content of organic matter. Permeability is slow, and available water capacity is moderate. These soils are subject to brief flooding from runoff received from adjacent soils.

Most areas of these soils are in cultivated crops. Areas in native grass are used for grazing and hay.

Representative profile of Witten silty clay, in cultivation, 1,960 feet east and 120 feet south of the northwest corner of sec. 29, T. 100 N., R. 76 W.:

Ap—0 to 5 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable, sticky and plastic; slight effervescence; neutral; abrupt smooth boundary.

A12—5 to 9 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine blocky and moderate medium subangular blocky structure; hard, friable, sticky and plastic; slight effervescence; neutral; abrupt wavy boundary.

B21t—9 to 14 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure parting to strong medium blocky; very hard, very firm, sticky and plastic; slight effervescence; mildly alkaline; clear wavy boundary.

B22t—14 to 26 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong fine and medium blocky structure; very hard, very firm, sticky and plastic; strong effervescence; mildly alkaline; clear irregular boundary.

B3—26 to 41 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium blocky structure; extremely hard, extremely firm, very sticky and very plastic; few dark grayish brown tongues ¼ to 1 inch wide; many pressure faces and common slickensides; strong effervescence; moderately alkaline; gradual wavy boundary.

Ccs—41 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; common fine nests of gypsum crystals; strong effervescence; moderately alkaline.

Free carbonates commonly are at or near the surface, but in places the A horizon and the upper part of the B horizon are noncalcareous. The A and B horizons have hue of 10YR or 2.5Y. All horizons are silty clay or clay. The A horizon is dark gray to grayish brown and is 8 to 15 inches thick. The B2t horizon is dark gray to grayish brown and is 12 to 20 inches thick. The B3 horizon is grayish brown or light brownish gray and in places contains fine and medium segregations of lime. The B3 and C horizons are mildly alkaline or moderately alkaline. The C horizon is grayish brown to pale olive in hue of 2.5Y or 5Y and has few to many nests of gypsum crystals. Some pedons have faint mottles of gray and yellowish brown and some have a buried A horizon within the C horizon.

Witten soils are near Boyd, Carter, Erd, Millboro, and Promise soils and are similar to Onita soils. They have a thicker A horizon than Boyd, Millboro, and Promise soils. Witten soils are less clayey in the B2t horizon than Carter soils and lack columnar structure in the B horizon. They are better drained and have salts deeper in the profile than Erd soils. Witten soils are more clayey than Onita soils.

Wn—Witten silty clay (0 to 2 percent slopes). This nearly level soil is in swales on uplands. Areas are long and narrow. They are 50 to 100 acres in size. Slopes are mostly slightly concave.

Included with this soil in mapping are small areas of Carter, Erd, and Millboro soils. Carter and Millboro soils are on slight rises on the edges of the mapped areas. Erd soils are in the lower part of some of the larger mapped areas. Small wet spots and gumbo or scabby spots are in some mapped areas and are shown on the soil map by a spot symbol.

Runoff is slow. Most areas receive runoff from adjacent soils. This soil takes in water slowly and loses tilth if farmed when wet. Maintaining tilth and improving water intake are the main concerns in management.

Most areas of this soil are in cultivated crops, mainly alfalfa, sorghum, and small grain. Capability unit IIIs–3; Clayey range site.

Wortman series

The Wortman series consists of moderately deep, nearly level, moderately well drained, silty soils that have a claypan subsoil. These soils are on terraces and in upland basins. They formed in material weathered from siltstone. The native vegetation is mid and short grasses.

In a representative profile the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is gray silt loam about 2 inches thick. The subsoil is about 10 inches thick. It is dark grayish brown clay in the upper part, grayish brown clay loam in the middle part, and pale brown clay loam in the lower part. The underlying material to a depth of 30 inches is very pale brown, calcareous loam. Very pale brown soft sandstone and siltstone are at a depth of 30 inches and are strongly alkaline.

Wortman soils are medium in fertility and moderate in content of organic matter. Permeability is very slow, and available water capacity is low.

Most areas of these soils remain in native grass and are used for grazing and hay. A few areas are in cultivated crops.

Representative profile of Wortman silt loam, in native grass, 125 feet east and 125 feet north of the southwest corner of sec. 27, T. 96 N., R. 79 W.:

A1—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

A2—7 to 9 inches; gray (10YR 5/1) silt loam, very dark grayish brown (10YR 3/2)

moist; weak medium and fine subangular blocky structure parting to weak fine granular; slightly hard, very friable; neutral; abrupt smooth boundary.

B21t—9 to 12 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium columnar structure; extremely hard, very firm, sticky and plastic; coatings of gray (10YR 5/1) on tops and upper sides of columns; neutral; clear wavy boundary.

B22t—12 to 15 inches; grayish brown (10YR 5/2) heavy clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate medium and fine blocky; very hard, very firm, sticky and plastic; few fine fragments of siltstone; mildly alkaline; clear wavy boundary.

B3—15 to 19 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak medium subangular blocky structure parting to weak fine blocky; hard, friable, slightly sticky and slightly plastic; slight effervescence in spots; moderately alkaline; abrupt wavy boundary.

C—19 to 30 inches; very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, slightly sticky; strong effervescence; moderately alkaline; clear wavy boundary.

Cr1—30 to 48 inches; very pale brown (10YR 7/3) soft siltstone, brown (10YR 5/3) moist; strong effervescence; strongly alkaline; abrupt wavy boundary.

Cr2—48 to 60 inches; very pale brown (10YR 7/3) soft very fine grained sandstone and siltstone, brown (10YR 5/3) moist; strongly alkaline.

Siltstone or sandstone is at a depth of 20 to 40 inches. The A horizon is loam in places. The A1 horizon is dark grayish brown or grayish brown and is 5 to 8 inches thick. The A2 horizon is gray to light brownish gray and is 1 to 3 inches thick. The B2t horizon is 5 to 10 inches thick. The B3 horizon is brown to light brown in hue of 10YR or 7.5YR and is clay loam or loam. It is 4 to 8 inches thick. The C horizon is light brownish gray to pink in hue of 10YR or 7.5YR and is loam or clay loam. The bedrock in the Cr horizon is weakly cemented to strongly cemented.

Wortman soils are mapped with Wanblee soils and near Huggins, Kadoka, and Shena soils. They contain more sodium than Huggins, Kadoka, and Shena soils and are deeper to siltstone than Shena soils. Wortman soils have a thicker A horizon than Wanblee soils.

Wo—Wortman silt loam (0 to 2 percent slopes). This soil is on terraces and in broad upland basins. Areas are irregular in shape and are 40 to more than 100 acres in size. In places the surface is uneven because of small mounds and small, concave, low spots. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Huggins, Keya, and Wanblee soils. Huggins soils are on slight rises that have a smooth surface. Keya soils are in swales. Wanblee soils are in some of the small, low spots or depressions.

Runoff is slow. The claypan subsoil takes in water slowly and releases moisture slowly to plants. In wet years planting is delayed in spring, but the soil commonly is droughty late in summer. This soil loses tilth if farmed when wet. Maintaining tilth, improving water intake, and conserving moisture are the main concerns in management.

Most areas of this soil remain in native grass and are used for grazing. Alfalfa and small grain are the main cultivated crops. Capability unit IVs–2; Claypan range site.

Use and management of the soils

The soil survey is a detailed analysis and evaluation of the most basic resource of Tripp County—the soil. It may be used to fit the use of the land, including urbanization, to the limitations and potentials of the natural resources and the environment and to help avoid soil-related failures in uses of the land.

During a soil survey soil scientists, conservationists, engineers, and others keep extensive notes, not only about the nature of the soils but also about unique aspects of behavior of these soils in the field and at construction sites. These notes include observations of erosion, drought damage to specific crops, crop yields, flooding, the functioning of septic systems, and other factors relating the kinds of soil and their productivity, potentials, and limitations under various uses and management. In this way field experience, incorporated with measured data on soil properties and performance, is used as a basis for predicting soil behavior.

Information in this section will be useful in applying basic facts about the soils to plans and decisions for use and management of soils for crops and pasture, range, woodland, and many nonfarm uses including building sites, highways and other transportation systems, sanitary facilities, parks and other recreational developments, and wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations for these land uses may be identified, and costly failures in homes and other structures because of unfavorable soil properties may be avoided. A site can be selected where the soil properties are favorable, or practices can be planned that will overcome the soil limitations.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the county or other broad planning area and on the environment. Both factors are closely related to the nature of the soil. Plans can be made to maintain or create a land use pattern in harmony with the natural soil.

Contractors can find information useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and

many other specialists can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, trees and shrubs, and most other uses of land are influenced by the nature of the soil.

Crops[3]

Fifty-six percent of Tripp County is in cultivated crops. Most of the cropland is in the Millboro-Lakoma, Reliance, and Anselmo-Holt associations. The main crops are alfalfa, corn, grain, sorghum, oats, and wheat. Nearly all wheat is winter wheat and most is planted on fallow.

Successful long-term cultivation of any soil depends on managing that soil according to its capabilities and limitations for crops. Management objectives that help to accomplish this in Tripp County are conserving moisture, controlling water erosion and soil blowing, and maintaining fertility and tilth. A sound conservation cropping system tailored to the properties of each soil or group of soils is a basic requirement to meet these objectives.

[3] By PAUL BODEN, conservation agronomist, Soil Conservation Service.

Some soils can be used for a single crop for many years without damage to the physical condition of the soil. Other soils deteriorate rapidly when used continuously for one crop, especially if it is a crop that produces little residue. A cropping system based on the properties of a soil helps to maintain tilth; reduce insect, disease, and weed infestations; and control water erosion and soil blowing. In most cases such a cropping system also helps to conserve moisture and maintain fertility.

In Tripp County conserving moisture generally means evenly distributing snow, reducing evaporation, limiting runoff, and controlling weeds. Among the effective measures are minimum tillage, stubble mulching, use of crop residue, wind stripcropping (fig. 17), field windbreaks or barriers, contour farming, terracing, and timely tillage. These practices also help to control water erosion and soil blowing. Where needed, grassed waterways, diversions, and emergency tillage also help to control water erosion and soil blowing. A combination of practices generally is used.

Among the measures that help to maintain soil tilth and structure are stubble mulching, minimum tillage, and use of crop residue, green manure crops, and grasses or legumes in the cropping system. These measures plus application of barnyard manure and

Figure 17.—**Wind stripcropping on Millboro silty clay, 3 to 6 percent slopes.**

chemical fertilizers help to maintain fertility. Controlling water erosion and soil blowing also helps to maintain fertility.

Small areas throughout the county are too wet for farming early in spring during most years. Conserving moisture on nearby sloping soils helps to reduce wetness in these small areas. Careful selection of crops for these and saline-alkaline areas increases residue and eventually improves the soil. Improved drainage helps to offset undesirable soil characteristics, such as wetness or saline-alkaline conditions.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, forest trees, or engineering.

In a capability system, the kinds of soil are grouped at three levels: the capability class, subclass, and unit. These are described in the following paragraphs.

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

Class I soils have few limitations that restrict their use. (None in Tripp County.)

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

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife habitat.

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, range, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, range, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitat, water supply, or esthetic purposes.

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

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclass. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management (*9*). Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–4 or IIIe–6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraphs; and the Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units

In the following pages the capability units in Tripp County are described and suggestions for their use and management are given. The capability units within a capability subclass are not numbered consecutively because not all units in the statewide system are used in this county. The capability classification of a given soil in this county can be found in the "Guide to mapping units" at the back of this survey.

Capability unit IIe–1

This unit consists of deep and moderately deep, nearly level to gently sloping, well drained, loamy and silty soils on uplands. The surface layer is loam, silt loam, or silty clay loam. These soils are mostly gently sloping, but some are nearly level.

These soils are medium in fertility and moderate in content of organic matter. Available water capacity is high in most of the soils but is low in some of the soils. Permeability is moderate to moderately slow. Runoff is medium. Controlling water erosion and soil blowing is the main concern in management. Conserving moisture and maintaining fertility, content of organic matter, and tilth are also important.

These soils are well suited to farming. Alfalfa, corn, oats, sorghum, and winter wheat are the main crops.

The use of crop residue, contour farming, contour

stripcropping, terraces, and grassed waterways help to control erosion, conserve moisture, and maintain fertility, organic-matter content, and tilth. Wind stripcropping and field windbreaks help to control soil blowing.

Capability unit IIc–1

This unit consists of deep, nearly level, well drained, loamy and silty soils on bottom lands. The surface layer ranges from fine sandy loam to silty clay loam and is underlain by stratified alluvium ranging from very fine sandy loam to silty clay loam.

These soils are low to high in fertility and low or moderate in content of organic matter. Available moisture capacity is high, and permeability is moderate. These soils receive additional moisture from stream flooding or as runoff from adjacent soils. Flood damages generally are minor, and late in summer crops suffer from a lack of moisture in some years. Conserving moisture is the main concern in management. Controlling soil blowing and improving fertility and organic-matter content in some of the soils also is important.

These soils are well suited to farming. Alfalfa, oats, and sorghum are the main crops. Corn and winter wheat are grown on some of the soils. A few areas are irrigated.

The use of crop residue, wind stripcropping, and winter cover crops help to control soil blowing. The use of crop residue also helps to conserve moisture. Animal manure and green manure crops help to improve fertility and organic-matter content.

Capability unit IIc–2

This unit consists of deep and moderately deep, nearly level, well drained, loamy and silty soils on uplands. The surface layer typically is loam, silt loam, or silty clay loam, and the subsoil is silty clay loam or clay loam.

These soils are medium in fertility and moderate in content of organic matter. Available water capacity is high in most of the soils but is low in some of the soils. Permeability is moderate or moderately slow. Runoff is slow. The hazard of soil blowing is slight. Other than limited rainfall, these soils have few limitations for crops. Conserving moisture is the main concern in management. Controlling soil blowing and maintaining fertility, organic-matter content, and tilth also are important.

These soils are well suited to alfalfa, corn, oats, sorghum, and winter wheat.

The use of crop residue helps to conserve moisture, control soil blowing, and maintain fertility and tilth. Wind stripcropping and field windbreaks also help to control soil blowing.

Capability unit IIc–3

This unit consists of deep, nearly level, moderately well drained soils in swales on uplands. The surface layer is silt loam, and the subsoil is clay loam, silty clay loam, and silty clay.

These soils are high in fertility and in content of organic matter. Available water capacity is high, and permeability is moderate or moderately slow. These soils receive additional moisture in the form of runoff from adjacent soils. The additional moisture is beneficial in most years, but in some years wetness delays planting. Runoff is slow. These soils have few limitations for crops other than moisture shortages in dry years. Conserving moisture is the main concern in management. Maintaining tilth also is important.

These soils are well suited to alfalfa, corn, oats, sorghum, and winter wheat.

The use of crop residue helps to conserve moisture and maintain tilth.

Capability unit IIIe–1

This unit consists of deep and moderately deep, moderately sloping, well drained, loamy and silty soils on uplands. The surface layer is loam or silty clay loam, and the subsoil is clay loam or silty clay loam.

These soils are medium in fertility and moderate in content of organic matter. Available water capacity is high in most of the soils, but is low in some of the soils. Permeability is moderate to moderately slow, and runoff is medium. Controlling water erosion is the main concern in management. Controlling soil blowing, conserving moisture, and maintaining fertility and tilth also are important.

These soils are suited to alfalfa, corn, oats, sorghum, and winter wheat.

The use of crop residue, contour farming, contour stripcropping, terraces, and grassed waterways help to control water erosion and conserve moisture. These practices and green manure crops help to maintain fertility and tilth.

Capability unit IIIe–4

This unit consists of deep, gently sloping, well drained, clayey soils on uplands. The surface layer and subsoil are clay or silty clay.

These soils are medium in fertility and moderate in content of organic matter. Available water capacity is low or moderate, and permeability is slow or very slow. Runoff is medium. These soils are difficult to till, and they lose their tilth if farmed when wet. Controlling water erosion and soil blowing, maintaining tilth, and improving water intake are the main concerns in management.

These soils are suited to alfalfa, oats, sorghum, and winter wheat.

The use of crop residue, contour farming, contour stripcropping, terraces, and grassed waterways help to control water erosion and soil blowing and to conserve moisture. Winter cover crops and field windbreaks also help to control soil blowing. The use of crop residue, green manure crops, timely tillage, and chiseling or subsoiling help to maintain tilth and improve water intake.

Capability unit IIIe–6

Canning loam, 2 to 5 percent slopes, is the only soil in this unit. It is gently sloping, well drained, and moderately deep over gravelly sand. The subsoil is clay loam.

This soil is medium in fertility and moderate in content of organic matter. Available water capacity is low or moderate, and the soil is somewhat droughty. Permeability is moderate in the subsoil and rapid in the underlying gravelly sand. Runoff is medium. Con-

trolling water erosion and conserving moisture are the main concerns in management. Maintaining fertility and tilth also are important.

Many areas of this soil are in native grass. Cultivated areas are better suited to early-maturing crops, such as alfalfa, oats, and wheat, than to corn.

The use of crop residue, contour farming, and contour stripcropping help to control water erosion and conserve moisture. The use of crop residue and green manure crops helps to maintain fertility and organic-matter content.

Capability unit IIIe–7

This unit consists of deep, nearly level to gently undulating, well drained, loamy soils on uplands and bottom lands. The surface layer typically is fine sandy loam.

Most of these soils are medium to high in fertility and moderate to high in content of organic matter. Available water capacity is moderate to high, and permeability is moderately rapid. Runoff is slow. The hazard of soil blowing is severe. Controlling soil blowing is the main concern in management. Conserving moisture and maintaining fertility and organic-matter content also are important.

These soils are suited to alfalfa, corn, oats, and sorghum.

The use of crop residue, wind stripcropping, winter cover crops, and field windbreaks help to control soil blowing and conserve moisture. These practices and green manure crops and animal manure help to maintain fertility and organic-matter content.

Capability unit IIIe–8

This unit consists of deep, gently sloping to moderately sloping, well drained, loamy soils on uplands. The surface layer and subsoil typically are fine sandy loam.

These soils are medium in fertility and moderate in content of organic matter. Available water capacity is moderate, and permeability is moderately rapid. Runoff is slow to medium. These soils blow easily, and cultivated areas also are subject to water erosion. Controlling soil blowing and water erosion are the main concerns in management. Conserving moisture and maintaining fertility and organic-matter content also are important.

Many areas are in cultivation. Alfalfa, corn, and oats are the main crops.

The use of crop residue, wind stripcropping, winter cover crops, and field windbreaks help to control soil blowing. Contour stripcropping helps to control water erosion where slopes are long and uniform. Green manure crops and animal manure help to maintain fertility and organic-matter content.

Capability unit IIIe–9

This unit consists of moderately deep and deep, nearly level to gently undulating, well drained, loamy soils on uplands. The surface layer typically is fine sandy loam, and the subsoil is fine sandy loam or sandy clay loam. Most of these soils are underlain by gravelly sand, sandstone, or shale at a moderate depth.

These soils are medium to low in fertility and moderate to moderately low in content of organic matter. Available water capacity is moderate to very low, and the soils are somewhat droughty. Permeability is moderate or moderately rapid in the subsoil and is very slow to rapid in the underlying material. Runoff is slow. Controlling soil blowing and conserving moisture are the main concerns in management. Maintaining fertility and organic-matter content also is important.

Many areas are in cultivation. Alfalfa, corn, and oats are the main crops. Some of the more droughty soils are better suited to early maturing small grain than to corn.

The use of crop residue, wind stripcropping, winter cover crops, and field windbreaks help to control soil blowing and conserve moisture. Green manure crops and animal manure help to maintain fertility and increase organic-matter content.

Capability unit IIIe–10

Wewela fine sandy loam, 3 to 6 percent slopes, is the only soil in this unit. It is gently sloping, well drained, and moderately deep over shale. The surface layer is fine sandy loam, and the subsoil is sandy clay loam.

This soil is medium in fertility and moderate in content of organic matter. Available water capacity is low or very low. Permeability is moderate in the upper part of the soil but is slow or very slow in the underlying clay and shale. This soil blows easily and is subject to water erosion. Controlling soil blowing and water erosion is the main concern in management. Conserving moisture and maintaining fertility and organic-matter content also are important.

Most areas are farmed. This soil is suited to alfalfa, corn, and oats.

The use of crop residue, contour stripcropping, wind stripcropping, winter cover crops, and field windbreaks help to control soil blowing and water erosion and conserve moisture. Green manure crops and animal manure help to maintain fertility and organic-matter content.

Capability unit IIIe–12

Huggins-Kadoka silt loams, 3 to 9 percent slopes, are the only soils in this unit. They are moderately deep, well drained, silty soils that are underlain by siltstone. The subsoil is silty clay loam and silty clay.

These soils are medium in fertility and moderate in content of organic matter. They are somewhat droughty because of their low available water capacity and limited root depth. Permeability is moderately slow in the Huggins soil, and runoff is medium. Controlling water erosion and conserving moisture are the main concerns in management. Controlling soil blowing and maintaining fertility and tilth also are important.

Most areas are in native grass. Alfalfa and small grain are the main cultivated crops.

The use of crop residue, contour stripcropping, and winter cover crops help to control water erosion and soil blowing and conserve moisture. Green manure crops and animal manure help to maintain fertility and tilth.

Capability unit IIIw–3

This unit consists of deep, nearly level, somewhat

poorly drained, clayey soils on stream terraces. These soils are clay throughout.

These soils are medium in fertility and moderate in content of organic matter. Available water capacity is low or moderate, and permeability is very slow. Wetness from a seasonal water table delays farming in some years. These soils are difficult to till, and they lose their tilth if farmed when wet. Controlling wetness, maintaining tilth, and improving water intake are the main concerns in management. Controlling soil blowing also is important.

Many areas are farmed. Alfalfa and winter wheat are the main crops.

Reducing runoff on adjacent uplands helps to reduce wetness. The use of crop residue and green manure crops and timely tillage help to maintain tilth and improve water intake.

Capability unit IIIw–5

Wann fine sandy loam is the only soil in this unit. It is deep, nearly level, and somewhat poorly drained and is on bottom lands. The underlying material is stratified sandy loam, loamy fine sand, and fine sandy loam.

This soil is medium in fertility and moderate in content of organic matter. Available water capacity is moderate, and permeability is moderately rapid. Wetness from a seasonal water table affects crop growth in some years, and the soil is subject to flooding. The hazard of soil blowing is severe when the soil lacks a cover of plants or crop aftermath. Controlling wetness and soil blowing is the main concern in management.

About half of the acreage is in cultivated crops. This soil is well suited to alfalfa and is moderately well suited to corn and small grain.

The use of crop residue, winter cover crops, and green manure crops helps to control soil blowing and maintain fertility and organic-matter content.

Capability unit IIIs–3

This unit consists of deep, nearly level, well drained and moderately well drained, clayey soils. The surface layer is clay or silty clay, and the subsoil is clay.

Most of these soils are medium in fertility and moderate in content of organic matter. Available water capacity is low or moderate. Permeability is slow or very slow, and runoff is slow. These soils are difficult to till, and traffic pans form if the soils are farmed when wet. They also are subject to soil blowing. Improving water intake, maintaining good tilth, and controlling soil blowing are the main concerns in management. Conserving moisture and maintaining fertility also are important.

Most areas are cultivated. Alfalfa, oats, sorghum, and winter wheat are the main crops.

The use of crop residue and green manure crops, timely tillage, and chiseling or subsoiling help to improve water intake, maintain tilth, and control soil blowing. Wind stripcropping and field windbreaks also help to control soil blowing.

Capability unit IIIs–5

Huggins silt loam, 0 to 3 percent slopes, is the only soil in this unit. It is moderately deep and well drained and is on uplands. It is underlain by siltstone. The subsoil is silty clay loam and silty clay.

This soil is medium in fertility and moderate in content of organic matter. It is somewhat droughty because of its low available water capacity and limited root zone. Permeability is moderately slow, and runoff is slow to medium. Conserving moisture is the main concern in management. Controlling soil blowing and maintaining tilth and fertility also are important.

Most areas are in native grass. Alfalfa, oats, and winter wheat are the main crops. Cultivated areas are better suited to these crops than to corn or sorghum.

The use of crop residue, wind stripcropping, and winter cover crops help to conserve moisture and control soil blowing. Green manure crops help to maintain tilth and fertility.

Capability unit IVe–1

This unit consists of deep and moderately deep, moderately sloping to strongly sloping, well drained, loamy and silty soils on uplands. The surface layer is loam, silt loam, and silty clay loam, and the subsoil is clay loam and silty clay loam. Some of the soils are underlain by siltstone or sandstone at a moderate depth. Some of the soils are moderately eroded to severely eroded.

Except for the eroded soils, these soils are medium in fertility and moderate in content of organic matter. Available water capacity is high in the deep soils but is slow in the moderately deep soils. Permeability is moderate or moderately slow, and runoff is medium. The hazard of water erosion is severe, and unprotected areas are subject to soil blowing. Controlling water erosion is the main concern in management. Controlling soil blowing, conserving moisture, and maintaining fertility and tilth also are important.

Many areas are in native grass, but some areas are farmed. Alfalfa, oats, and winter wheat are the main crops. Row crops are not suited to these soils, because of the erosion hazard.

The use of crop residue, contour farming or contour stripcropping, winter cover crops, terraces, and grassed waterways help to control water erosion and soil blowing. Green manure crops and animal manure help to maintain or improve fertility and tilth.

Capability unit IVe–4

This unit consists of deep and moderately deep, well drained, clayey soils on uplands. Most of the soils are moderately sloping but some are gently sloping. The surface layer is silty clay or clay, and the subsoil is clay.

These soils are medium or low in fertility and moderate or moderately low in content of organic matter. Available water capacity is moderate or low in most of the soils, and permeability is slow or very slow. Runoff is medium. These soils are difficult to till, and traffic pans form if the soils are farmed when wet. The hazards of water erosion and soil blowing are severe when cultivated fields lack a cover of plants or crop residue. Controlling water erosion and soil blowing, maintaining tilth, and improving water intake are major concerns in management. Conserving moisture and maintaining fertility also are important.

Many areas are farmed, but some areas are in native

grass. Winter wheat, oats, and sorghum are the main crops.

The use of crop residue, contour stripcropping, winter cover crops, terraces, and grassed waterways help to control erosion and soil blowing and to conserve moisture. Green manure crops, timely tillage, and chiseling or subsoiling help to maintain tilth and improve water intake.

Capability unit IVe–8

This unit consists of deep and moderately deep, moderately sloping, well drained soils on uplands. The surface layer and subsoil typically are fine sandy loam. Some of the soils are underlain by sandstone at a moderate depth.

These soils are medium in fertility and moderate in content of organic matter. Available water capacity is moderate or low, and permeability is moderately rapid in most of the soils. The hazard of soil blowing is severe, and cultivated areas are subject to water erosion. Controlling water erosion and soil blowing is the main concern in management. Conserving moisture and maintaining fertility also are important.

Many areas are in native grass, but some areas are farmed. Alfalfa, corn, and oats are the main crops.

The use of crop residue, contour stripcropping, winter cover crops, and green manure crops help to control soil blowing and water erosion, conserve moisture, and maintain fertility and organic-matter content. Wind stripcropping and field windbreaks also help to control soil blowing.

Capability unit IVe–9

This unit consists of deep, nearly level to undulating, well drained to somewhat excessively drained, sandy soils. The surface layer of most of these soils is loamy fine sand underlain by loamy fine sand or fine sand. One of the soils is underlain by shale at a depth of 26 inches. A somewhat poorly drained soil is in some areas of this capability unit.

These soils are medium or low in fertility and moderate to low in content of organic matter. Available water capacity is moderate to very low. Permeability is rapid in most of these soils, and runoff is slow. The hazard of soil blowing is very severe when the soil lacks a cover of plants or crop aftermath. Controlling soil blowing is the main concern in management. Conserving moisture and maintaining or improving fertility and content of organic matter also are important.

Many areas are in native grass, but some areas are cultivated. Alfalfa, corn, and oats are the main crops.

The use of crop residue, wind stripcropping, winter cover crops, and field windbreaks help to control soil blowing and conserve moisture. Green manure crops and animal manure help to improve fertility and organic-matter content.

Capability unit IVe–10

Elsmere fine sandy loam is the only soil in this unit. It is deep, nearly level, and somewhat poorly drained and is underlain by fine sand.

This soil is medium in fertility and moderately low in content of organic matter. Available water capacity is moderate or low, but a seasonal water table is at a depth of 2 to 6 feet. Permeability is rapid. Controlling soil blowing is the main concern in management. Wetness limits the use of this soil for crops during wet years.

About half of the acreage is farmed. This soil is suited to alfalfa, corn, oats, and tame grasses.

The use of crop residue, wind stripcropping, and winter cover crops help to control soil blowing. Green manure crops and animal manure help to improve content of organic matter.

Capability unit IVe–13

This unit consists of deep, nearly level, moderately well drained soils that have a claypan subsoil. The surface layer is fine sandy loam, and the compact subsoil is sandy clay loam and fine sandy loam that is very strongly alkaline.

These soils are medium in fertility and moderate in content of organic matter. Available water capacity is low or moderate, and permeability is slow. Wetness from a seasonal water table delays farming in some years. The claypan subsoil releases moisture slowly to plants, and crops suffer from the lack of moisture late in summer. The hazard of soil blowing is severe when the soils are farmed. Controlling soil blowing is the main concern in management. Conserving moisture, improving water intake in the subsoil, and maintaining fertility and organic-matter content also are important.

Most areas are in native grass, but some areas are farmed. This soil is better suited to alfalfa, small grain, and tame grasses than to most other crops. Corn also is grown.

The use of crop residue, wind stripcropping, and winter cover crops help to control soil blowing. Chiseling or subsoiling helps to improve water intake in the subsoil. Green manure crops help to maintain fertility and organic-matter content.

Capability unit IVw–1

This unit consists of deep, nearly level and level, poorly drained soils on bottom lands and in closed depressions. The surface layer is loam or silt loam. Some of these soils have a high content of lime and are underlain by loamy to sandy alluvium. The soils in depressions have a surface layer that is slightly acid and subsoil and underlying material that are clay.

These soils are medium in fertility and moderate in content of organic matter. Their use for crops is limited by wetness from a water table or from flooding. Available water capacity is moderate, and permeability is rapid in one soil and very slow in the other. Wetness is the main concern in management. Maintaining tilth and controlling soil blowing also are important.

Most areas are in native grass and are used for hay. These soils are poorly suited to annual crops because of wetness and are better suited to tame and native grasses. The surrounding soils generally determine the use of the depressional soils in this unit.

Reducing runoff on adjacent soils helps to improve drainage in these soils. Timely tillage is important on the depressional soils in this unit. The use of crop residue helps to control soil blowing and maintain tilth.

Capability unit IVs–2

This unit consists of deep and moderately deep, nearly level, moderately well drained soils that have a claypan subsoil. The surface layer is silt loam or silty clay loam, and the subsoil is clay and clay loam.

These soils are medium in fertility and moderate in content of organic matter. Available water capacity is moderate or low, and permeability is very slow. The claypan subsoil releases moisture slowly to plants and restricts root development. Maintaining tilth, improving water intake, and conserving moisture are the main concerns in management. Controlling soil blowing and maintaining fertility also are important.

Most areas are in native grass, but some areas are farmed. These soils are better suited to alfalfa, small grain, and tame grasses than to corn.

The use of crop residue, chiseling or subsoiling, and green manure crops help to maintain fertility and tilth, improve water intake, and conserve moisture. Wind stripcropping and winter cover crops help to control soil blowing.

Capability unit Vw–4

Kolls clay is the only soil in this unit. It is deep, level, and poorly drained and is in closed depressions. The subsoil and underlying material are clay.

This soil is medium in fertility and moderate in content of organic matter. Runoff ponds on this soil and it is too wet for cultivation. Available water capacity is moderate, and permeability is very slow.

Nearly all areas are in native grass and are used for hay or grazing.

Reducing runoff from adjacent soils helps to reduce wetness from ponding. Proper range use helps to maintain a good plant cover. This soil is well suited to dugouts to provide livestock water.

Capability unit VIe–3

Westover loam, 9 to 25 percent slopes, is the only soil in this unit. It is deep, strongly sloping to moderately steep, well drained, and calcareous. It is on terrace escarpments. Below the surface layer are loam and fine sandy loam to a depth of 32 inches. Sand and gravel is at a depth of 32 inches.

This soil is low in fertility and content of organic matter. Available water capacity is moderate. Permeability is moderate in the upper part of the soil and is rapid in the sand and gravel. Runoff is rapid. These soils have a very severe hazard of water erosion. Controlling water erosion is the main concern in management.

All areas are in native grass. This soil generally is too steep and too erodible for cultivation.

Proper range use helps to maintain a good plant cover and control erosion.

Capability unit VIe–4

This unit consists mostly of moderately deep, strongly sloping to moderately steep, well drained, clayey soils on uplands. The surface layer is silty clay or clay, and the subsoil is clay. These soils are underlain by shale at a moderate depth. Also in this unit are shallow clay soils that are mapped with the other soils.

These soils are medium to low in fertility and moderate or moderately low in content of organic matter. Available water capacity is low or very low, and permeability is slow or very slow. Runoff is rapid. The hazard of water erosion is severe. Controlling water erosion is the main concern in management.

Nearly all areas are in native grass and are used for grazing. These soils generally are too steep and too erodible for cultivation.

Proper range use helps to maintain a good plant cover and control water erosion.

Capability unit VIe–5

This unit consists mostly of moderately sloping to strongly sloping, well drained soils that are moderately deep over gravelly sand. The surface layer is loam and fine sandy loam, and the subsoil is clay loam and fine sandy loam. Also in this unit are shallow soils over gravelly sand that are mapped with the other soils.

The dominant soils are medium in fertility and moderate in content of organic matter. Available water capacity is low or moderate. Permeability is moderate or moderately rapid in the subsoil and is rapid in the underlying gravelly sand. Runoff is medium. These soils are subject to water erosion and soil blowing when they are farmed. Controlling water erosion and soil blowing and conserving moisture are the main concerns in management.

Most areas are in native grass and are used for grazing. These soils generally are too erodible for cultivation.

Proper range use helps to control water erosion and soil blowing and conserve moisture.

Capability unit VIe–6

This unit consists mainly of deep, strongly sloping to steep, well drained soils on uplands. These soils formed in sandy materials. Nearly level to gently rolling soils that are moderately eroded to severely eroded by soil blowing are also in this unit. The surface layer is fine sandy loam or loamy fine sand, and the subsoil is fine sandy loam. A soil that is shallow to sandstone is in some areas.

These soils are medium in fertility and moderate in content of organic matter. They are highly susceptible to soil blowing and water erosion. Available water capacity is moderate in most of the soils, and permeability is moderately rapid. Runoff is slow to medium. Controlling soil blowing and water erosion is the main concern in management.

Most of the areas are in native grass and are used for grazing. Some of the eroded areas have been smoothed and seeded to tame or native grasses or to alfalfa. These soils generally are too erodible for cultivation.

Proper range use helps to control soil blowing and water erosion.

Capability unit VIe–7

This unit consists of deep, undulating to rolling, well drained to excessively drained, sandy soils on uplands. The surface layer and underlying layer are loamy fine sand or fine sand. Some areas have a hummocky surface and are moderately eroded to severely eroded by soil blowing. A soil that is shallow to sandstone is in some areas.

These soils are low in fertility and are moderately low or low in content of organic matter. Permeability is moderately rapid or rapid. Available water capacity is low in most of the soils. Runoff is slow or very slow, and most of the rainfall enters the soil. These soils have a very severe hazard of soil blowing and sand blowouts form easily where livestock concentrate or where the surface is disturbed. Controlling soil blowing is the main concern in management.

Most areas are in native grass. Some of the formerly cultivated areas have been smoothed and are seeded to tame grasses or to alfalfa. These soils generally are too sandy for farming.

Proper range use helps to maintain a good plant cover and control soil blowing. Dune stabilization helps to restore vegetation in areas of sand blowout.

Capability unit VIe–8

The only soils in this unit are those in Bankard complex. They are deep, nearly level, and well drained and are on bottom lands. The surface layer is silty clay loam, loam, fine sandy loam, or loamy fine sand and is underlain by stratified sandy alluvium.

These soils are low in fertility and content of organic matter. Available water capacity is low. Permeability is rapid, and runoff is slow. The hazard of soil blowing is very severe if the surface is disturbed.

All areas are in native vegetation. This soil generally is not suited to farming because of low fertility, droughtiness, and the hazard of soil blowing. It is well suited to grazing.

The native vegetation provides winter protection and cover for livestock and wildlife. Proper range use helps to control soil blowing.

Capability unit VIe–10

The Tassel part of Ronson-Tassel fine sandy loams, 0 to 6 percent slopes, is the only soil in this unit. It is shallow, nearly level to gently sloping, and well drained and is on uplands. All layers above the underlying sandstone are calcareous fine sandy loam.

This soil is low in fertility and in content of organic matter. Available water capacity is very low. Permeability is moderately rapid, and runoff is slow. Disturbed areas are subject to soil blowing and water erosion.

Nearly all areas are in native grass. This soil generally is not suited to farming. The proper use of range helps to maintain a good plant cover and to control soil blowing and water erosion.

Capability unit VIe–11

This unit consists of shallow, nearly level to moderately steep, well drained soils on uplands. The surface layer is loam or silt loam, and the underlying material is loam, silt loam, or silty clay loam. Sandstone or siltstone is at a depth of less than 20 inches.

Most of these soils are low in fertility and in content of organic matter. Available water capacity is very low. Permeability is moderate or moderately slow above the sandstone or siltstone. Runoff is medium to rapid. The hazard of water erosion is severe if the soils are farmed.

Most areas are in native grass. These soils generally are not suited to crops because of low fertility, droughtiness, and the severe hazard of erosion.

Proper range use helps to control water erosion and conserve moisture.

Capability unit VIw–1

This unit consists of deep, nearly level, well drained to somewhat excessively drained soils on bottom lands. The surface layer is loamy fine sand to clay, and the underlying material is stratified sandy to clayey alluvium.

These soils are subject to flooding, and the areas are dissected by meandering channels that divide the narrow areas into small tracts. Streambank erosion is active in some areas.

Most of the areas are in native grass and are used for grazing. Some of the soils are suited to small garden tracts. Farming generally is not practical on many of the areas because of their small size and inaccessibility to farming equipment. Most of the areas are better suited to range or wildlife habitat.

Proper range use helps to maintain a good plant cover.

Capability unit VIs–1

This unit consists of moderately deep and deep, nearly level, moderately well drained to somewhat poorly drained soils that have a claypan subsoil. The surface layer is thin and is silt loam or fine sandy loam, and the claypan subsoil is clay, clay loam, or sandy clay loam. Some of the soils are underlain by siltstone at a moderate depth.

These soils are low in fertility. Available water capacity is very low to moderate, and permeability is slow or very slow. The dense claypan subsoil in these soils releases moisture slowly to plants and restricts root growth. These soils have poor tilth if they are cultivated. Some of these soils have a seasonal water table.

Most areas are in native grass, but some areas are farmed. These soils generally are not suited to cultivation and are better suited to range.

Proper range use helps to maintain a good plant cover and conserve moisture.

Capability unit VIs–4

Dix fine sandy loam, 0 to 3 percent slopes, is the only soil in this unit. It is nearly level, somewhat excessively drained to excessively drained, and shallow to gravelly sand. The surface layer is underlain by fine sandy loam and gravelly sandy loam. Gravelly sand is at a depth of about 12 inches.

This soil is low in fertility and moderately low in content of organic matter. Available water capacity is very low or low, and permeability is rapid. Runoff is slow, and most of the rainfall enters the soil.

All areas are in native grass. This soil generally is too droughty for cultivation.

Proper range use helps to maintain a good plant cover and conserve moisture.

Capability unit VIs–5

Swanboy clay is the only soil in this unit. It is deep, nearly level to gently sloping, and well drained. The

surface layer and subsoil are clay. Nests of salt crystals are at a depth of about 12 inches.

This soil is low in fertility and moderately low in content of organic matter. Available water capacity is low, and permeability is very slow. This soil is difficult to till, and the dense clay subsoil releases moisture slowly to plants and restricts root growth.

All areas are in native grass. This soil generally is not suited to cultivation.

Proper range use helps to control water erosion and conserve moisture.

Capability unit VIIe–4

This unit consists of shallow, strongly sloping to steep, well drained, loamy soils on uplands. The surface layer and underlying layer are calcareous fine sandy loam to a depth of about 14 inches. Calcareous sandstone is at a depth of about 14 inches.

These soils are low in fertility and in content of organic matter. Available water capacity is very low, and permeability is moderately rapid above the sandstone. Runoff is medium to rapid. These soils are highly susceptible to water erosion and soil blowing if the plant cover is removed.

All areas are in native grass and are used for grazing. These soils are too shallow and too steep for cultivation.

Proper range use helps to control water erosion and soil blowing.

Capability unit VIIe–8

This unit consists of shallow, moderately steep to very steep, well drained, clayey soils on uplands. The surface layer is clay or silty clay, and the underlying layer is clay or shaly clay. Soft shale is at a depth of less than 20 inches in most of the soils.

These soils are low in fertility and in content of organic matter. Available water capacity is very low, and permeability is slow. Runoff is rapid to very rapid. The hazard of water erosion is very severe if the plant cover is disturbed.

All areas are in native grass and are used for grazing. These soils are too shallow and too steep for cultivation.

Proper range use helps to control erosion and conserve moisture.

Capability unit VIIs–4

This unit consists of strongly sloping to steep, well drained to excessively drained soils that are shallow or very shallow over gravelly sand. The surface layer is fine sandy loam or gravelly loam. Gravelly sand is at a depth of less than 20 inches. A soil that has a thin clay loam subsoil is mapped with these soils in some areas.

These soils are low in fertility and low or moderately low in content of organic matter. Available water capacity is low or very low, and permeability is rapid. Runoff is medium. These soils are susceptible to water erosion and soil blowing if the plant cover is disturbed.

All areas are in native grass and are used for grazing. These soils are too droughty and too steep for cultivation.

Proper range use helps to conserve moisture and control water erosion and soil blowing.

Capability unit VIIIw–1

Areas that are mapped as Marsh are in this unit. They are in closed depressions that remain wet during the growing season and periodically are under water. Open water is in the center of some of the areas. Some of the smaller areas of Marsh become dry late in summer.

Most areas are too wet for pasture or range plants, and the plant cover is mainly rushes, cattails, and sedges. These areas are better suited to wildlife habitat than to most other uses.

Capability unit VIIIs–1

This unit consists of outcrops of sandstone that form ledges and crags in the higher part of some landscapes. These areas are bare of vegetation and are suited mainly to scenery and to recreation, such as searching for fossils.

Capability unit VIIIs–2

This unit consists only of the Shale outcrop part of Sansarc-Shale outcrop complex, 25 to 40 percent slopes. These areas are on rounded knolls and ridgetops, around the heads of drainageways, and on almost vertical cutbanks resulting from landslides. They consist of outcrops of dark gray shale that supports little or no vegetation. Manganese concretions and fragments of fossils commonly are scattered on the surface. These areas are better suited to wildlife habitat and to recreation, such as searching for fossils, than to most other uses.

Tame pasture[4]

Tame pasture is a practical and feasible land use for many soils in the county. The primary objectives of pasture management are to maintain vigorous stands of palatable, well adapted forage for livestock feed; to improve the soil; and to control water erosion and soil blowing. Management that provides proper grazing, adequate fertility, clipping, and weed control helps to meet these objectives.

Proper grazing includes delaying grazing until vegetation has a good start in spring, never grazing too closely, rotation grazing, grazing at the optimum time, and periodic resting. A good fertility program involves adding fertilizer when needed and maintaining an adequate supply of all plant nutrients. Clipping some grasses helps to distribute grazing and stimulate even regrowth. Where stands are thin, control of weeds by mowing or spraying results in more available moisture and plant nutrients for desirable species.

In the following paragraphs, soils that have the ability to produce about the same kind and amount of tame grasses and legumes with similar treatment are grouped together. Only those groups of the statewide system that are present in the county are described. Only those soils suited to tame pasture are placed in a pasture suitability group. The pasture suitability group of a given soil can be found in the "Guide to mapping units."

[4] PAUL M. BODEN, conservation agronomist, Soil Conservation Service.

Pasture group A

This group consists of deep, somewhat poorly drained and poorly drained soils in low lying areas. These soils receive additional moisture from runoff or have a high water table within the root zone or both. The high water table is of such short duration that plant growth is not adversely affected. All climatically adapted grasses and legumes are suited to these soils, but only plants capable of using the extra moisture are recommended.

Among the grasses and legumes suited to this group are alfalfa, big bluestem, creeping foxtail, green needlegrass, indiangrass, intermediate wheatgrass, reed canarygrass, smooth bromegrass, and switchgrass.

Pasture group B

This group consists of deep, poorly drained soils in low lying areas that receive additional moisture from runoff or have a water table within the root zone, or both. Artificial drainage is not feasible on these soils. Excess moisture limits choice of plants to water-tolerant species.

Among the grasses suited to this group are creeping foxtail, reed canarygrass, and western wheatgrass.

Pasture group C

This group consists of deep and moderately deep, moderately well drained or somewhat poorly drained soils on uplands, terraces, and fans. These soils have a silty or loamy surface layer about 6 to 12 inches thick over a claypan subsoil. They have very slow permeability. The lower part of the subsoil and the substratum typically are high in soluble salts. Choice of plants and production are limited by slow or very slow permeability and by an unfavorable root zone.

Among the grasses and legumes suited to this group are alfalfa, crested wheatgrass, green needlegrass, intermediate wheatgrass, pubescent wheatgrass, smooth bromegrass, and western wheatgrass.

Pasture group D

This group consists of well drained soils that are moderately deep over sand and gravel. These soils have moderate or moderately rapid permeability in the upper part and rapid permeability in the underlying sand and gravel. These soils have low or moderate available water capacity. Choice of plants and production are limited by the moderately deep root zone and by less than optimum available water capacity.

Among the grasses and legumes suited to this group are alfalfa, crested wheatgrass, green needlegrass, intermediate wheatgrass, pubescent wheatgrass, and smooth bromegrass.

Pasture group E

This group consists of moderately deep, well drained, nearly level to moderately sloping soils on uplands. These soils have a silty surface layer over a compact, fine textured subsoil. They have moderately slow permeability. Choice of plants and production are somewhat limited by the unfavorable root zone.

Among the grasses and legumes suited to this group are alfalfa, green needlegrass, intermediate wheatgrass, and smooth bromegrass.

Pasture group F

This group consists of deep and moderately deep, well drained, nearly level to sloping, loamy and silty soils on uplands and terraces. These soils have moderate or moderately slow permeability. All climatically adapted plants are suited to these soils, but bunch-type species planted alone are not suitable for slopes of 6 percent or more.

Among the grasses and legumes suited to this group are alfalfa, green needlegrass, intermediate wheatgrass, and smooth bromegrass.

Pasture group G

This group consists of deep, well drained, nearly level, silty soils on bottom lands. These soils are calcareous at a depth of 10 inches or less. Choice of plants and production are limited by low fertility, high lime content, and the severe hazard of erosion.

Among the grasses and legumes suited to this group are alfalfa, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and smooth bromegrass.

Pasture group H

This group consists of deep and moderately deep, nearly level to strongly sloping, loamy and sandy soils on rarely flooded low terraces and bottom lands and on terraces and uplands. These soils have moderately rapid or rapid permeability and very low to moderate available water capacity. The hazard of soil blowing is severe. Choice of plants is somewhat limited by available water capacity and the hazard of soil blowing.

Among the grasses and legumes suited to this group are alfalfa, intermediate wheatgrass, sand bluestem, and smooth bromegrass.

Pasture group I

This group consists of deep and moderately deep, well drained or moderately well drained nearly level to strongly sloping, clayey soils on uplands, fans, and terraces. These soils have slow or very slow permeability and a very slow rate of water intake. Choice of plants and production are limited by the very slow rate of water intake and by an unfavorable root zone.

Among the grasses and legumes suited to this group are alfalfa, green needlegrass, intermediate wheatgrass, smooth bromegrass, and western wheatgrass.

Pasture group K

This group consists of deep, moderately well drained or well drained soils in swales and on broad flats that receive additional moisture from runoff. These soils have a thicker dark colored surface layer than the adjacent upland soils. They have moderate or moderately slow permeability and high available water capacity. All climatically adapted plants are suited to these soils, and production is higher than on adjacent upland soils.

Among the grasses and legumes suited to this group are alfalfa, big bluestem, green needlegrass, indiangrass, intermediate wheatgrass, smooth bromegrass, and switchgrass.

Yields

The average yields per acre that can be expected of the principal crops on the soils of Tripp County under a high level of management are shown in table 2. In any given year, yields may be higher or lower than those indicated in table 2 because of seasonal variations in rainfall and other climatic factors. Absence of a yield estimate indicates that the crop is not suited to or not commonly grown on the soil.

The predicted yields are based mainly on the experiences and records of farmers, conservationists, and Extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The latest soil and crop management used by many farmers in the county is assumed in predicting the yields. Hay and pasture yields are predicted for varieties of grasses and legumes suited to the soil. A few farmers may be using more advanced practices and are obtaining average yields higher than those shown in table 2.

The management needed to achieve the indicated yields of the various crops depends upon the kind of soil and on the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; 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; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

The predicted yields reflect the relative productive capacity of the soils for each of the principal crops. Yields are likely to increase in the future as new production technology is developed. The relative productivity of a given soil compared to other soils, however, is not likely to change.

Crops other than those shown in table 2 are grown in the survey area, but because their acreage is small, predicted yields for these crops are not included. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the productivity and management concerns of the soils for these crops.

Range [5]

About 38 percent of Tripp County is range. More than half of the farm income is derived from livestock, principally cattle. Cow-calf operations are dominant throughout the county. The average size of ranches is about 11,050 acres.

On many ranches the forage produced on range is supplemented with crop stubble, forage sorghum, and tame pasture. In winter the native forage is often supplemented with protein concentrate. Calves and yearlings are creep-fed to increase market weight on some ranches.

[5] By C. M. SCHUMACHER, range conservationist, Soil Conservation Service.

The native vegetation in many parts of the county has been greatly depleted by continued excessive use. The amount of forage produced may be less than half of that originally produced. Productivity of the range can be increased by using management that is effective for specific kinds of soil and range sites.

Where climate and topography are similar, differences in the kind and amount of vegetation that range can produce are related closely to the kind of soil. Effective management is based on the relationships among soils, vegetation, and water.

Table 3 shows, for each kind of soil, the name of the range site; the potential annual production of herbage in favorable, normal, and unfavorable years; and the names of major plant species and the percentage of each in the composition of the potential plant community.

A range site supports a distinctive potential plant community, or combination of plants, that can grow on a site that has not undergone major disturbance. Soils that produce the same kind, amount, and proportion of range plants are grouped into range sites. Range sites can be interpreted directly from the soil map where the relationships between soils and vegetation have been correlated. Properties that determine the capacity of the soil to supply moisture and plant nutrients have the greatest influence on range plants and their productivity. Soil reaction, salt content, and a seasonal high water table also are important.

Potential production refers to the amount of herbage that can be expected to grow on well managed range that is supporting the potential plant community. It is expressed in pounds per acre of air-dry herbage for favorable, normal, and unfavorable years. A favorable year is one in which the amount and distribution of precipitation and the temperatures result in growing conditions substantially better than average; a normal year is one in which these conditions are about average for the area; an unfavorable year is one in which growing conditions are well below average, generally because of low available soil moisture.

Dry weight refers to the total air-dry herbage produced per acre each year by the potential plant community. All herbage that is highly palatable and that is unpalatable to livestock is included. Some of the herbage also may be grazed extensively by wildlife and some of it may not.

Common names are listed for the grasses, forbs, and shrubs that make up most of the potential plant community on each soil. Under the heading, "Composition," in table 3, the proportion of each species is presented as the percentage, in dry weight, of the total annual production of herbaceous and woody plants. The amount that can be used as forage depends on the kind of grazing animals and on the season when the forage is grazed. Not all of the herbage produced is normally used.

Range management requires, in addition to knowledge of the kind of soil and the potential plant community, an evaluation of the present condition of the range vegetation in relation to its potential production. Range condition is an expression of how the present plant community compares with the potential plant community on a particular kind of soil and range site. The more nearly alike are the present kinds and

TABLE 2.—*Yields per acre of crops and pasture*

[All yields were estimated for a high level of management. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Soil name and map symbol	Corn	Oats	Winter wheat	Grain sorghum	Alfalfa hay	Cool-season grass
	Bu	*Bu*	*Bu*	*Bu*	*Ton*	*AUM* [1]
Anselmo:						
AaB2	35	41			1.9	3.2
AbB	31	35			1.5	2.5
AbC						
AbD	30	34			1.4	2.3
[2] AhC						
[2] AtD	44	51			2.3	3.6
[2] AvA						
Bankard:						
[2] Ba						
Boro:						
[2] BmC	25	39	29	30	1.5	2.4
Boyd:						
BnC	24	39	29	28	1.3	2.2
[2] BOD						
Bridgeport:						
[2] Bp	48	57	43	50	2.5	4.2
Bt					2.5	4.2
Canning:						
CaB	27	47	31	35	1.2	2.0
[2] CbD						
Carter:						
Cc	26	42	30	37	1.1	2.0
Cass:						
Cd	37	46			2.0	3.3
Chappell:						
ChA	27	32			1.1	1.8
[2] CnC						
Dix:						
DaA, [2] DbD						
Doger:						
DgB	31	33			1.8	3.0
[2] DmA	33	40			2.1	3.3
Dunday:						
DnC2, [2] DuC						
Elsmere:						
Em	35	47			2.6	4.6
Epping:						
EpE						
Erd:						
Er	27	37	32	42	2.6	4.2
[2] Es	23	32	27	36	2.2	3.5
Haverson:						
Ha	40	45	33	41	1.9	3.2
Holt:						
[2] HbA	37	46			1.7	2.8
Huggins:						
HgA	36	46	35	41	1.2	2.0
[2] HkB	35	45	34	39	1.3	2.1

TABLE 2.—*Yields per acre of crops and pasture*—Continued

Soil name and map symbol	Corn	Oats	Winter wheat	Grain sorghum	Alfalfa hay	Cool-season grass
	Bu	*Bu*	*Bu*	*Bu*	*Ton*	*AUM* [1]
Hurley:						
Hr						
Inavale:						
Ia	30	34			1.6	2.7
[2] Ic						
Kadoka:						
KaA	41	50	41	42	1.5	2.5
[2] KbD	23	32	26	23	1.0	1.6
Keya:						
Ke	52	58	43	60	2.2	3.7
Kolls:						
Ko						
Lakoma:						
[2] LkC	24	35	28	33	1.3	2.1
[2] LoD						
Lowry:						
LwA	38	51	35	43	1.8	3.3
Manter:						
MaA	35	43			1.5	2.5
MaB	32	39			1.4	2.3
[2] MfE						
Marsh:						
Mh						
Millboro:						
MoA	38	54	42	53	2.0	3.3
MoB	36	52	39	50	1.9	3.2
MoC	31	45	34	41	1.6	2.7
Mosher:						
Mr		32	22	23	1.3	2.2
[2] Ms		24	16	17	1.0	1.6
Munjor:						
[2] Mu	38	42		36	1.7	2.8
Okaton:						
[2] OAF, [2] OBE, [2] OcF						
Onita:						
On	49	63	44	61	2.5	4.0
[2] Oo	40	53	37	52	2.1	3.4
Opal:						
OpC	21	35	28	26	1.3	2.2
[2] OsE						
Orwet:						
Ow	40				3.0	5.0
Promise:						
PrA	30	53	38	46	1.5	2.6
PrB	28	50	36	44	1.5	2.5
PrC	23	42	30	35	1.3	2.2
PsA					1.7	2.8
PtA	30	53	38	46	1.8	2.8
Ree:						
RaA	38	53	37	46	1.6	2.7
RaB	35	51	35	43	1.5	2.5
RaC	31	46	31	38	1.5	2.5
RaD						

TABLE 2.—*Yields per acre of crops and pasture*—Continued

Soil name and map symbol	Corn	Oats	Winter wheat	Grain sorghum	Alfalfa hay	Cool-season grass
	Bu	*Bu*	*Bu*	*Bu*	*Ton*	*AUM* [1]
Reliance:						
ReA	48	53	41	56	2.4	4.0
ReB	45	50	39	53	2.3	3.8
ReC	42	45	36	51	2.0	3.3
ReC2	35	38	27	34	1.7	2.8
Ronson:						
RfA	16	30	----	----	0.8	1.3
[2] RoB	13	24	----	----	0.6	1.0
Rosebud:						
RsB	33	43	38	30	1.3	2.2
[2] RuC	23	31	30	20	0.9	1.5
[2] RuD	----	26	21	14	0.8	1.4
Sansarc:						
[2] SAE, [2] ScF	----	----	----	----	----	----
Schamber:						
[2] ShE	----	----	----	----	----	----
Scott:						
So	25	----	20	30	2.0	3.2
Shena:						
SsB	----	----	----	----	----	----
Swanboy:						
Sw	----	----	----	----	----	----
Tassel:						
TaE, [2] TrF	----	----	----	----	----	----
Valentine:						
VaD, [2] VdC, [2] VnD	----	----	----	----	----	----
Vetal:						
Vt	56	58	----	----	2.4	4.0
Wanblee:						
[2] Wa	----	20	12	17	0.7	1.1
Wann:						
Wb	52	49	----	----	2.8	4.7
Westover:						
WeE	----	----	----	----	----	----
Wewela:						
WfA	28	36	----	----	1.7	2.5
WgA	38	40	----	----	2.0	3.2
WgB	34	36	----	----	1.6	2.3
Whitelake:						
Wh	----	35	----	----	1.4	2.3
[2] Wk	----	25	----	----	1.0	1.6
Witten:						
Wn	44	63	47	63	2.2	3.5
Wortman:						
Wo	----	27	16	23	1.0	1.8

[1] 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 a period of 30 days.

[2] This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

[3] Yields are for areas protected from flooding.

TABLE 3.—*Range productivity and composition*

[Soils not listed are not in range sites; such soils can be used for grazing if grass cover is established]

Soil name and map symbol	Range site	Potential production		Common plants	Composition
		Kind of year	Dry weight		
			Lb/acre		*Pct*
Anselmo:					
AaB2, AbB, AbC, AbD	Sandy	Favorable	2,880	Little bluestem	30
		Normal	2,400	Prairie sandreed	30
		Unfavorable	1,680	Blue grama	10
				Needleandthread	10
				Big bluestem	5
				Leadplant	5
				Sedge	5
[1] AhC:					
Anselmo part	Sandy	Favorable	2,880	Little bluestem	30
		Normal	2,400	Prairie sandreed	30
		Unfavorable	1,680	Blue grama	10
				Needleandthread	10
				Big bluestem	5
				Leadplant	5
				Sedge	5
Holt part	Sandy	Favorable	3,000	Little bluestem	40
		Normal	2,500	Prairie sandreed	15
		Unfavorable	1,750	Needleandthread	10
				Blue grama	10
				Big bluestem	5
				Porcupinegrass	5
				Leadplant	5
				Sedge	5
[1] AtD:					
Anselmo part	Sandy	Favorable	2,880	Little bluestem	30
		Normal	2,400	Prairie sandreed	30
		Unfavorable	1,680	Blue grama	10
				Needleandthread	10
				Big bluestem	5
				Leadplant	5
				Sedge	5
Tassel part	Shallow	Favorable	2,400	Little bluestem	35
		Normal	2,000	Sideoats grama	20
		Unfavorable	1,400	Needleandthread	10
				Threadleaf sedge	10
				Blue grama	10
				Sand dropseed	5
[1] AvA:					
Anselmo part	Sandy	Favorable	3,120	Little bluestem	25
		Normal	2,600	Prairie sandreed	25
		Unfavorable	1,820	Needleandthread	15
				Blue grama	10
				Big bluestem	10
				Leadplant	5
				Sedge	5
Vetal part	Sandy	Favorable	3,240	Little bluestem	20
		Normal	2,700	Prairie sandreed	20
		Unfavorable	1,890	Needleandthread	10
				Sideoats grama	10
				Blue grama	10
				Big bluestem	10
				Switchgrass	10
				Western wheatgrass	5
Bankard:					
[1] Ba	Sands	Favorable	3,240	Sand bluestem	35
		Normal	2,700	Prairie sandreed	15
		Unfavorable	1,890	Switchgrass	15
				Indiangrass	10
				Sand dropseed	5
				Blue grama	5

TABLE 3.—*Range productivity and composition*—Continued

Soil name and map symbol	Range site	Potential production		Common plants	Composition
		Kind of year	Dry weight		
			Lb/acre		*Pct*
Boro:					
[1] BmC:					
Boro part	Clayey	Favorable	2,760	Western wheatgrass	50
		Normal	2,300	Green needlegrass	35
		Unfavorable	1,610	Sideoats grama	5
				Blue grama	5
Millboro part	Clayey	Favorable	2,520	Western wheatgrass	50
		Normal	2,100	Green needlegrass	25
		Unfavorable	1,470	Blue grama	10
				Sideoats grama	5
				Buffalograss	5
Boyd:					
BnC	Clayey	Favorable	2,400	Western wheatgrass	50
		Normal	2,000	Green needlegrass	25
		Unfavorable	1,400	Blue grama	10
				Sideoats grama	5
				Buffalograss	5
[1] BOD:					
Boyd part	Clayey	Favorable	2,400	Western wheatgrass	50
		Normal	2,000	Green needlegrass	25
		Unfavorable	1,400	Blue grama	10
				Sideoats grama	5
				Buffalograss	5
Okaton part	Shallow	Favorable	2,160	Little bluestem	35
		Normal	1,800	Sideoats grama	25
		Unfavorable	1,260	Blue grama	10
				Big bluestem	5
				Western wheatgrass	5
				Sedge	5
				Small soapweed	5
Bridgeport:					
Bp	Overflow	Favorable	3,850	Western wheatgrass	45
		Normal	3,500	Green needlegrass	20
		Unfavorable	2,450	Big bluestem	10
				Blue grama	10
				Sideoats grama	5
				Sedge	5
Bt	Overflow	Favorable	3,850	Western wheatgrass	45
		Normal	3,500	Green needlegrass	20
		Unfavorable	2,450	Big bluestem	10
				Blue grama	10
				Sideoats grama	5
				Sedge	5
Canning:					
CaB	Silty	Favorable	2,880	Western wheatgrass	30
		Normal	2,400	Green needlegrass	20
		Unfavorable	1,680	Needleandthread	10
				Sideoats grama	10
				Blue grama	10
				Sedge	5
				Big bluestem	5
				Little bluestem	5
[1] CbD:					
Canning part	Silty	Favorable	2,520	Western wheatgrass	30
		Normal	2,100	Green needlegrass	20
		Unfavorable	1,470	Needleandthread	10
				Sideoats grama	10
				Blue grama	10
				Sedge	5
				Big bluestem	5
				Little bluestem	5

TABLE 3.—*Range productivity and composition*—Continued

Soil name and map symbol	Range site	Potential production		Common plants	Composition
		Kind of year	Dry weight		
			Lb/acre		*Pct*
Murdo part	Shallow to Gravel	Favorable	1,800	Needleandthread	25
		Normal	1,500	Blue grama	25
		Unfavorable	900	Sedge	20
				Sideoats grama	5
				Plains muhly	5
Carter:					
Cc	Claypan	Favorable	2,640	Western wheatgrass	45
		Normal	2,200	Green needlegrass	25
		Unfavorable	1,540	Blue grama	10
				Sideoats grama	5
				Buffalograss	5
				Sedge	5
Cass:					
Cd	Sandy	Favorable	3,120	Prairie sandreed	25
		Normal	2,600	Big bluestem	15
		Unfavorable	1,820	Needleandthread	15
				Blue grama	15
				Western wheatgrass	10
				Little bluestem	5
Chappell:					
ChA	Sandy	Favorable	2,760	Prairie sandreed	25
		Normal	2,300	Needleandthread	20
		Unfavorable	1,610	Blue grama	15
				Threadleaf sedge	10
				Sand dropseed	10
[1] CnC:					
Chappell part	Sandy	Favorable	2,760	Prairie sandreed	25
		Normal	2,300	Needleandthread	20
		Unfavorable	1,610	Blue grama	15
				Threadleaf sedge	10
				Sand dropseed	10
Dix part	Shallow to Gravel	Favorable	2,040	Needleandthread	30
		Normal	1,700	Blue grama	15
		Unfavorable	1,020	Sideoats grama	10
				Little bluestem	10
				Plains muhly	10
				Threadleaf sedge	10
				Sand dropseed	5
Dix:					
DaA, [1] DbD	Shallow to Gravel	Favorable	2,040	Needleandthread	30
		Normal	1,700	Blue grama	15
		Unfavorable	1,020	Sideoats grama	10
				Little bluestem	10
				Plains muhly	10
				Threadleaf sedge	5
				Sand dropseed	5
Doger:					
DgB	Sandy	Favorable	2,880	Little bluestem	25
		Normal	2,400	Prairie sandreed	25
		Unfavorable	1,680	Needleandthread	10
				Sideoats grama	10
				Blue grama	10
				Western wheatgrass	5
				Big bluestem	5
				Switchgrass	5
[1] DmA:					
Doger part	Sandy	Favorable	3,120	Little bluestem	20
		Normal	2,600	Prairie sandreed	20
		Unfavorable	1,820	Needleandthread	10
				Sideoats grama	10
				Blue grama	10
				Big bluestem	10
				Switchgrass	10
				Western wheatgrass	5

TABLE 3.—*Range productivity and composition*—Continued

Soil name and map symbol	Range site	Potential production		Common plants	Composition
		Kind of year	Dry weight		
			Lb/acre		*Pct*
Elsmere part	Subirrigated	Favorable	5,280	Big bluestem	55
		Normal	4,800	Indiangrass	10
		Unfavorable	3,850	Switchgrass	10
				Sedge	10
				Prairie cordgrass	5
				Western wheatgrass	5
Dunday:					
DnC2	Sands	Favorable	3,360	Sand bluestem	25
		Normal	2,800	Little bluestem	20
		Unfavorable	1,960	Prairie sandreed	20
				Needleandthread	10
				Blue grama	5
				Switchgrass	5
				Sedge	5
[1] DuC:					
Dunday part	Sands	Favorable	3,360	Sand bluestem	25
		Normal	2,800	Little bluestem	20
		Unfavorable	1,960	Prairie sandreed	20
				Needleandthread	10
				Blue grama	5
				Switchgrass	5
				Sedge	5
Doger part	Sandy	Favorable	2,880	Little bluestem	25
		Normal	2,400	Prairie sandreed	25
		Unfavorable	1,680	Needleandthread	10
				Sideoats grama	10
				Blue grama	10
				Western wheatgrass	5
				Big bluestem	5
				Switchgrass	5
Elsmere:					
Em	Subirrigated	Favorable	5,280	Big bluestem	55
		Normal	4,800	Indiangrass	10
		Unfavorable	3,850	Switchgrass	10
				Sedge	10
				Prairie cordgrass	5
				Western wheatgrass	5
Epping:					
EpE	Shallow	Favorable	1,800	Little bluestem	25
		Normal	1,500	Blue grama	15
		Unfavorable	1,050	Needleandthread	15
				Western wheatgrass	15
				Threadleaf sedge	10
				Sideoats grama	10
Erd:					
Er	Clayey	Favorable	2,760	Western wheatgrass	40
		Normal	2,300	Green needlegrass	30
		Unfavorable	1,610	Sideoats grama	10
				Blue grama	10
				Sedge	5
[1] Es:					
Erd part	Clayey	Favorable	2,760	Western wheatgrass	40
		Normal	2,300	Green needlegrass	30
		Unfavorable	1,610	Sideoats grama	10
				Blue grama	10
				Sedge	5
Hurley part	Thin Claypan	Favorable	1,320	Blue grama	40
		Normal	1,100	Western wheatgrass	15
		Unfavorable	660	Buffalograss	15
				Needleandthread	10
				Sedge	10

TABLE 3.—*Range productivity and composition*—Continued

Soil name and map symbol	Range site	Potential production		Common plants	Composition
		Kind of year	Dry weight		
			Lb/acre		*Pct*
Haverson:					
Ha	Overflow	Favorable	3,600	Big bluestem	30
		Normal	3,000	Western wheatgrass	25
		Unfavorable	2,100	Green needlegrass	15
				Blue grama	10
				Switchgrass	10
				Sedge	5
Holt:					
[1] HbA:					
Holt part	Sandy	Favorable	3,120	Little bluestem	35
		Normal	2,600	Prairie sandreed	15
		Unfavorable	1,820	Big bluestem	10
				Needleandthread	10
				Blue grama	10
				Porcupinegrass	5
				Leadplant	5
				Sedge	5
Anselmo part	Sandy	Favorable	3,120	Little bluestem	25
		Normal	2,600	Prairie sandreed	25
		Unfavorable	1,820	Needleandthread	15
				Blue grama	10
				Big bluestem	10
				Leadplant	5
				Sedge	5
Huggins:					
HgA	Clayey	Favorable	3,240	Western wheatgrass	45
		Normal	2,700	Green needlegrass	30
		Unfavorable	1,890	Sideoats grama	10
				Blue grama	5
				Sedge	5
[1] HkB:					
Huggins part	Clayey	Favorable	3,000	Western wheatgrass	40
		Normal	2,500	Green needlegrass	30
		Unfavorable	1,750	Sideoats grama	10
				Blue grama	10
				Sedge	5
Kadoka part	Silty	Favorable	2,880	Western wheatgrass	30
		Normal	2,400	Green needlegrass	15
		Unfavorable	1,680	Needleandthread	15
				Little bluestem	10
				Sideoats grama	10
				Blue grama	10
				Big bluestem	5
Hurley:					
Hr	Thin Claypan	Favorable	1,320	Blue grama	40
		Normal	1,100	Western wheatgrass	15
		Unfavorable	660	Buffalograss	15
				Needleandthread	10
				Sedge	10
Inavale:					
Ia	Sands	Favorable	3,360	Big bluestem	30
		Normal	2,800	Prairie sandreed	20
		Unfavorable	1,960	Little bluestem	15
				Needleandthread	15
				Switchgrass	5
				Porcupinegrass	5
				Sedge	5

TABLE 3.—*Range productivity and composition*—Continued

Soil name and map symbol	Range site	Potential production		Common plants	Composition
		Kind of year	Dry weight		
			Lb/acre		*Pct*
[1] Ic	Overflow	Favorable	4,440	Big bluestem	45
		Normal	3,700	Porcupinegrass	15
		Unfavorable	2,590	Little bluestem	10
				Prairie sandreed	10
				Switchgrass	5
				Sedge	5
				Needleandthread	5
Kadoka:					
KaA	Silty	Favorable	3,120	Western wheatgrass	30
		Normal	2,600	Green needlegrass	15
		Unfavorable	1,820	Needleandthread	15
				Big bluestem	10
				Sideoats grama	10
				Blue grama	10
				Little bluestem	5
[1] KbD:					
Kadoka part	Silty	Favorable	2,880	Western wheatgrass	30
		Normal	2,400	Green needlegrass	15
		Unfavorable	1,680	Needleandthread	15
				Little bluestem	10
				Sideoats grama	10
				Blue grama	10
				Big bluestem	5
Epping part	Shallow	Favorable	1,800	Little bluestem	25
		Normal	1,500	Blue grama	15
		Unfavorable	1,050	Needleandthread	15
				Western wheatgrass	15
				Threadleaf sedge	10
				Sideoats grama	10
Keya:					
Ke	Overflow	Favorable	3,740	Sand bluestem	35
		Normal	3,400	Western wheatgrass	25
		Unfavorable	2,380	Green needlegrass	15
				Sideoats grama	10
				Needleandthread	5
				Prairie sandreed	5
Kolls:					
Ko	Closed Depression	Favorable	3,740	Western wheatgrass	70
		Normal	3,400	Blue grama	10
		Unfavorable	2,380	Sedge	10
				Buffalograss	5
Lakoma:					
[1] LkC:					
Lakoma part	Clayey	Favorable	2,640	Western wheatgrass	55
		Normal	2,200	Green needlegrass	30
		Unfavorable	1,540	Sideoats grama	5
				Blue grama	5
Millboro part	Clayey	Favorable	2,520	Western wheatgrass	50
		Normal	2,100	Green needlegrass	25
		Unfavorable	1,470	Blue grama	10
				Sideoats grama	5
				Buffalograss	5
[1] LoD:					
Lakoma part	Clayey	Favorable	2,520	Western wheatgrass	50
		Normal	2,100	Green needlegrass	25
		Unfavorable	1,470	Blue grama	10
				Sideoats grama	5
				Buffalograss	5

TABLE 3.—*Range productivity and composition*—Continued

Soil name and map symbol	Range site	Potential production		Common plants	Composition
		Kind of year	Dry weight		
			Lb/acre		*Pct*
Okaton part	Shallow	Favorable	2,160	Little bluestem	35
		Normal	1,800	Sideoats grama	25
		Unfavorable	1,260	Blue grama	10
				Big bluestem	5
				Western wheatgrass	5
				Sedge	5
				Small soapweed	5
Lowry:					
LwA	Silty	Favorable	3,360	Western wheatgrass	35
		Normal	2,800	Green needlegrass	20
		Unfavorable	1,960	Big bluestem	10
				Needleandthread	10
				Little bluestem	5
				Sideoats grama	5
				Blue grama	5
				Sedge	5
Manter:					
MaA, MaB	Sandy	Favorable	2,880	Little bluestem	25
		Normal	2,400	Prairie sandreed	20
		Unfavorable	1,680	Needleandthread	15
				Blue grama	10
				Western wheatgrass	10
				Sideoats grama	10
[1] MfE:					
Manter part	Sandy	Favorable	2,880	Little bluestem	25
		Normal	2,400	Prairie sandreed	20
		Unfavorable	1,680	Needleandthread	15
				Blue grama	10
				Western wheatgrass	10
				Sideoats grama	10
Anselmo part	Sandy	Favorable	2,880	Little bluestem	30
		Normal	2,400	Prairie sandreed	30
		Unfavorable	1,680	Blue grama	10
				Needleandthread	10
				Big bluestem	5
				Leadplant	5
				Sedge	5
Millboro:					
MoA	Clayey	Favorable	2,760	Western wheatgrass	55
		Normal	2,300	Green needlegrass	30
		Unfavorable	1,610	Sideoats grama	5
				Blue grama	5
MoB, MoC	Clayey	Favorable	2,520	Western wheatgrass	50
		Normal	2,100	Green needlegrass	25
		Unfavorable	1,470	Blue grama	10
				Sideoats grama	5
				Buffalograss	5
Mosher:					
Mr	Claypan	Favorable	1,920	Western wheatgrass	40
		Normal	1,600	Blue grama	20
		Unfavorable	1,120	Green needlegrass	10
				Buffalograss	10
				Sedge	10
				Needleandthread	5
[1] Ms:					
Mosher part	Claypan	Favorable	1,920	Western wheatgrass	40
		Normal	1,600	Blue grama	20
		Unfavorable	1,120	Green needlegrass	10
				Buffalograss	10
				Sedge	10
				Needleandthread	5

TABLE 3.—*Range productivity and composition*—Continued

Soil name and map symbol	Range site	Potential production		Common plants	Composition
		Kind of year	Dry weight		
			Lb/acre		*Pct*
Jerauld part	Thin Claypan	Favorable	1,320	Blue grama	30
		Normal	1,100	Western wheatgrass	25
		Unfavorable	660	Needleandthread	15
				Buffalograss	10
				Sedge	10
Munjor:					
Mu	Overflow	Favorable	3,800	Big bluestem	20
		Normal	3,200	Prairie sandreed	20
		Unfavorable	2,240	Western wheatgrass	15
				Switchgrass	10
				Green needlegrass	10
				Blue grama	10
Okaton:					
[1] OAF	Shallow	Favorable	1,920	Little bluestem	30
		Normal	1,600	Sideoats grama	30
		Unfavorable	1,120	Blue grama	10
				Big bluestem	5
				Western wheatgrass	5
				Sedge	5
				Small soapweed	5
[1] OBE:					
Okaton part	Shallow	Favorable	1,920	Little bluestem	30
		Normal	1,600	Sideoats grama	30
		Unfavorable	1,120	Blue grama	10
				Big bluestem	5
				Western wheatgrass	5
				Sedge	5
				Small soapweed	5
Lakoma part	Clayey	Favorable	2,520	Western wheatgrass	50
		Normal	2,100	Green needlegrass	25
		Unfavorable	1,470	Blue grama	10
				Sideoats grama	5
				Buffalograss	5
[1] OcF:					
Okaton part	Shallow	Favorable	1,920	Little bluestem	30
		Normal	1,600	Sideoats grama	30
		Unfavorable	1,120	Blue grama	10
				Big bluestem	5
				Western wheatgrass	5
				Sedge	5
				Small soapweed	5
Rock outcrop part.					
Onita:					
On	Overflow	Favorable	3,850	Big bluestem	65
		Normal	3,500	Green needlegrass	10
		Unfavorable	2,450	Western wheatgrass	5
				Sideoats grama	5
				Leadplant	5
				Sedge	5
[1] Oo:					
Onita part	Overflow	Favorable	3,850	Big bluestem	40
		Normal	3,500	Green needlegrass	10
		Unfavorable	2,450	Western wheatgrass	5
				Sideoats grama	5
				Leadplant	5
				Sedge	5

TABLE 3.—*Range productivity and composition*—Continued

Soil name and map symbol	Range site	Potential production		Common plants	Composition
		Kind of year	Dry weight		
			Lb/acre		*Pct*
Mosher part	Claypan	Favorable	1,920	Western wheatgrass	40
		Normal	1,600	Blue grama	20
		Unfavorable	1,120	Green needlegrass	10
				Buffalograss	10
				Sedge	10
				Needleandthread	5
Opal:					
OpC	Clayey	Favorable	2,280	Western wheatgrass	50
		Normal	1,900	Green needlegrass	25
		Unfavorable	1,330	Blue grama	10
				Sideoats grama	5
				Buffalograss	5
[1] OsE:					
Opal part	Clayey	Favorable	2,280	Western wheatgrass	50
		Normal	1,900	Green needlegrass	25
		Unfavorable	1,330	Blue grama	10
				Sideoats grama	5
				Buffalograss	5
Sansarc part	Shallow	Favorable	1,920	Little bluestem	35
		Normal	1,600	Sideoats grama	20
		Unfavorable	1,120	Blue grama	15
				Needleandthread	10
				Green needlegrass	5
				Sedge	5
Orwet:					
Ow	Subirrigated	Favorable	5,500	Big bluestem	35
		Normal	5,000	Indiangrass	15
		Unfavorable	4,000	Switchgrass	10
				Prairie cordgrass	10
				Western wheatgrass	10
				Sedge	10
Promise:					
PrA, PtA	Clayey	Favorable	2,520	Western wheatgrass	55
		Normal	2,100	Green needlegrass	30
		Unfavorable	1,470	Sideoats grama	5
				Blue grama	5
PrB, PrC	Clayey	Favorable	2,280	Western wheatgrass	50
		Normal	1,900	Green needlegrass	25
		Unfavorable	1,330	Blue grama	10
				Sideoats grama	5
				Buffalograss	5
PsA	Overflow	Favorable	2,880	Western wheatgrass	40
		Normal	2,400	Green needlegrass	30
		Unfavorable	1,680	Sideoats grama	10
				Blue grama	10
				Sedge	5
Ree:					
RaA, RaB, RaC, RaD	Silty	Favorable	3,000	Western wheatgrass	40
		Normal	2,500	Green needlegrass	20
		Unfavorable	1,750	Blue grama	15
				Needleandthread	10
				Sideoats grama	10
Reliance:					
ReA	Silty	Favorable	2,760	Western wheatgrass	35
		Normal	2,300	Green needlegrass	20
		Unfavorable	1,610	Needleandthread	15
				Sideoats grama	10
				Blue grama	10
				Sedge	5

TABLE 3.—*Range productivity and composition*—Continued

Soil name and map symbol	Range site	Potential production		Common plants	Composition
		Kind of year	Dry weight		
			Lb/acre		*Pct*
ReB, ReC, ReC2	Silty	Favorable	2,520	Western wheatgrass	30
		Normal	2,100	Green needlegrass	20
		Unfavorable	1,470	Needleandthread	15
				Blue grama	15
				Sideoats grama	10
				Sedge	5
Ronson:					
RfA	Sandy	Favorable	3,120	Little bluestem	20
		Normal	2,600	Prairie sandreed	20
		Unfavorable	1,820	Needleandthread	10
				Sideoats grama	10
				Blue grama	10
				Big bluestem	10
				Switchgrass	10
				Western wheatgrass	5
[1] RoB:					
Ronson part	Sandy	Favorable	3,120	Little bluestem	20
		Normal	2,600	Prairie sandreed	20
		Unfavorable	1,820	Needleandthread	10
				Sideoats grama	10
				Blue grama	10
				Big bluestem	10
				Switchgrass	10
				Western wheatgrass	5
Tassel part	Shallow	Favorable	2,400	Little bluestem	35
		Normal	2,000	Sideoats grama	20
		Unfavorable	1,400	Needleandthread	10
				Threadleaf sedge	10
				Blue grama	10
				Sand dropseed	5
Rosebud:					
RsB	Silty	Favorable	2,280	Needleandthread	20
		Normal	1,900	Western wheatgrass	20
		Unfavorable	1,300	Blue grama	15
				Green needlegrass	15
				Threadleaf sedge	10
				Little bluestem	5
				Buffalograss	5
				Sand dropseed	5
[1] RuC:					
Rosebud part	Silty	Favorable	2,280	Needleandthread	20
		Normal	1,900	Western wheatgrass	20
		Unfavorable	1,300	Blue grama	15
				Green needlegrass	15
				Threadleaf sedge	10
				Little bluestem	5
				Buffalograss	5
				Sand dropseed	5
Canyon part	Shallow	Favorable	2,040	Little bluestem	25
		Normal	1,700	Needleandthread	15
		Unfavorable	1,190	Western wheatgrass	15
				Sideoats grama	10
				Blue grama	10
				Threadleaf sedge	10
				Prairie sandreed	5
[1] RuD:					
Rosebud part	Silty	Favorable	2,280	Needleandthread	20
		Normal	1,900	Western wheatgrass	20
		Unfavorable	1,300	Blue grama	15
				Green needlegrass	15
				Threadleaf sedge	10
				Little bluestem	5
				Buffalograss	5
				Sand dropseed	5

TABLE 3.—*Range productivity and composition*—Continued

Soil name and map symbol	Range site	Potential production		Common plants	Composition
		Kind of year	Dry weight		
			Lb/acre		*Pct*
Canyon part	Shallow	Favorable	2,040	Little bluestem	25
		Normal	1,700	Needleandthread	15
		Unfavorable	1,190	Western wheatgrass	15
				Sideoats grama	10
				Blue grama	10
				Threadleaf sedge	10
				Prairie sandreed	5
Sansarc:					
[1] SAE:					
Sansarc part	Shallow	Favorable	1,680	Little bluestem	30
		Normal	1,400	Sideoats grama	25
		Unfavorable	980	Blue grama	15
				Needleandthread	10
				Green needlegrass	5
				Sedge	5
Opal part	Clayey	Favorable	2,280	Western wheatgrass	50
		Normal	1,900	Green needlegrass	25
		Unfavorable	1,330	Blue grama	10
				Sideoats grama	5
				Buffalograss	5
[1] ScF:					
Sansarc part	Shallow	Favorable	1,680	Little bluestem	30
		Normal	1,400	Sideoats grama	25
		Unfavorable	980	Blue grama	15
				Needleandthread	10
				Green needlegrass	5
				Sedge	5
Shale outcrop part.					
Schamber:					
[1] ShE:					
Schamber part	Very Shallow	Favorable	1,440	Needleandthread	30
		Normal	1,200	Blue grama	30
		Unfavorable	720	Sedge	20
				Buffalograss	5
Murdo part	Shallow to Gravel	Favorable	1,800	Needleandthread	25
		Normal	1,500	Blue grama	25
		Unfavorable	900	Sedge	20
				Sideoats grama	5
				Plains muhly	5
Scott:					
So	Closed Depression	Favorable	3,960	Western wheatgrass	50
		Normal	3,600	Sedge	20
		Unfavorable	2,880	Blue grama	15
				Buffalograss	5
Shena:					
SsB	Clayey	Favorable	2,160	Western wheatgrass	45
		Normal	1,800	Blue grama	25
		Unfavorable	1,260	Buffalograss	10
				Broom snakeweed	10
				Sideoats grama	5
				Sedge	5
Swanboy:					
Sw	Dense Clay	Favorable	1,820	Western wheatgrass	60
		Normal	1,400	Green needlegrass	25
		Unfavorable	840		

TABLE 3.—*Range productivity and composition*—Continued

Soil name and map symbol	Range site	Potential production		Common plants	Composition
		Kind of year	Dry weight		
			Lb/acre		*Pct*
Tassel:					
TaE	Shallow	Favorable	2,280	Little bluestem	30
		Normal	1,900	Sideoats grama	20
		Unfavorable	1,330	Needleandthread	15
				Threadleaf sedge	10
				Blue grama	10
				Sand dropseed	5
[1] TrF:					
Tassel part	Shallow	Favorable	2,280	Little bluestem	30
		Normal	1,900	Sideoats grama	20
		Unfavorable	1,330	Needleandthread	15
				Threadleaf sedge	10
				Blue grama	10
				Sand dropseed	5
Rock outcrop part.					
Valentine:					
VaD	Sands	Favorable	3,240	Prairie sandreed	30
		Normal	2,700	Sand bluestem	20
		Unfavorable	1,890	Little bluestem	15
				Needleandthread	10
				Indiangrass	5
				Sedge	5
				Blue grama	5
				Leadplant	5
[1] VdC:					
Valentine part	Sands	Favorable	3,240	Prairie sandreed	30
		Normal	2,700	Sand bluestem	20
		Unfavorable	1,890	Little bluestem	15
				Needleandthread	10
				Indiangrass	5
				Sedge	5
				Blue grama	5
				Leadplant	5
Dunday part	Sands	Favorable	3,360	Sand bluestem	25
		Normal	2,800	Little bluestem	20
		Unfavorable	1,960	Prairie sandreed	20
				Needleandthread	10
				Blue grama	5
				Switchgrass	5
				Sedge	5
[1] VnD:					
Valentine part	Sands	Favorable	3,240	Prairie sandreed	30
		Normal	2,700	Sand bluestem	20
		Unfavorable	1,890	Little bluestem	15
				Needleandthread	10
				Indiangrass	5
				Sedge	5
				Blue grama	5
				Leadplant	5
Tassel part	Shallow	Favorable	2,400	Little bluestem	35
		Normal	2,000	Sideoats grama	20
		Unfavorable	1,400	Needleandthread	10
				Threadleaf sedge	10
				Blue grama	10
				Sand dropseed	5

TABLE 3.—*Range productivity and composition*—Continued

Soil name and map symbol	Range site	Potential production		Common plants	Composition
		Kind of year	Dry weight		
			Lb/acre		*Pct*
Vetal:					
Vt	Sandy	Favorable	3,240	Little bluestem	20
		Normal	2,700	Prairie sandreed	20
		Unfavorable	1,890	Needleandthread	10
				Sideoats grama	10
				Blue grama	10
				Big bluestem	10
				Switchgrass	10
				Western wheatgrass	5
Wanblee:					
[1]Wa:					
Wanblee part	Thin Claypan	Favorable	1,440	Blue grama	40
		Normal	1,200	Western wheatgrass	15
		Unfavorable	720	Buffalograss	15
				Needleandthread	10
				Sedge	10
Wortman part	Claypan	Favorable	1,920	Western wheatgrass	40
		Normal	1,600	Blue grama	20
		Unfavorable	1,120	Green needlegrass	10
				Buffalograss	10
				Sedge	10
				Needleandthread	5
Wann:					
Wb	Subirrigated	Favorable	6,050	Big bluestem	50
		Normal	5,500	Western wheatgrass	10
		Unfavorable	4,400	Indiangrass	10
				Sedge	10
				Switchgrass	5
				Prairie cordgrass	5
				Bluegrass	5
Westover:					
WeE	Thin Upland	Favorable	2,160	Little bluestem	20
		Normal	1,800	Needleandthread	20
		Unfavorable	1,260	Western wheatgrass	20
				Sideoats grama	15
				Blue grama	10
				Sedge	5
Wewela:					
WfA, WgA	Sandy	Favorable	3,240	Little bluestem	25
		Normal	2,700	Prairie sandreed	15
		Unfavorable	1,890	Big bluestem	10
				Needleandthread	10
				Blue grama	10
				Switchgrass	10
				Western wheatgrass	5
				Sideoats grama	5
WgB	Sandy	Favorable	3,000	Little bluestem	30
		Normal	2,500	Prairie sandreed	15
		Unfavorable	1,750	Needleandthread	10
				Sideoats grama	10
				Blue grama	10
				Big bluestem	5
				Western wheatgrass	5
				Switchgrass	5
Whitelake:					
Wh	Sandy	Favorable	3,480	Little bluestem	20
		Normal	2,900	Prairie sandreed	20
		Unfavorable	2,030	Needleandthread	10
				Sideoats grama	10
				Blue grama	10
				Big bluestem	10
				Western wheatgrass	5
				Switchgrass	5

TABLE 3.—*Range productivity and composition*—Continued

Soil name and map symbol	Range site	Potential production		Common plants	Composition
		Kind of year	Dry weight		
			Lb/acre		*Pct*
[1] Wk: Whitelake part	Sandy	Favorable	3,480	Little bluestem	20
		Normal	2,900	Prairie sandreed	20
		Unfavorable	2,030	Needleandthread	10
				Sideoats grama	10
				Blue grama	10
				Big bluestem	10
				Western wheatgrass	5
				Switchgrass	5
Lute part	Saline Lowland	Favorable	3,300	Prairie cordgrass	35
		Normal	3,000	Inland saltgrass	25
		Unfavorable	2,400	Western wheatgrass	20
				Alkali cordgrass	10
Witten: Wn	Clayey	Favorable	2,880	Western wheatgrass	40
		Normal	2,400	Green needlegrass	30
		Unfavorable	1,680	Sideoats grama	10
				Buffalograss	10
				Sedge	5
Wortman: Wo	Claypan	Favorable	1,920	Western wheatgrass	40
		Normal	1,600	Blue grama	20
		Unfavorable	1,120	Green needlegrass	10
				Buffalograss	10
				Sedge	10
				Needleandthread	5

[1] This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

amount of plants and the potential plant community, the better the range condition. The general objective in range management is to manage grazing so that the plants growing on a site are about the same in kind and amount as the potential native plant community for that site. Such management generally results in the maximum production of herbage, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential fits grazing needs, provides wildlife habitat, or provides other benefits as well as protecting soil and water resources.

In the northern part of the county most soils are clayey. They support many cool-season grasses, such as western wheatgrass and green needlegrass. In much of the southern part the soils are sandy. They support more of the warm-season grasses, such as little bluestem and prairie sandreed. Potential productivity of these two areas is about equal.

The major concern in management on most of the range is controlling grazing so that the kind and amount of plants that make up the potential plant community are reestablished. Controlling water erosion and minimizing soil blowing also are important. If sound range management based on the soil survey information and on range inventories is applied, there is good potential for increasing the productivity of range in the county.

Native woods and windbreaks [6]

Tripp County has about 11,680 acres of native trees and shrubs. Most of the areas are on bottom lands along the White and Keya Paha Rivers and their tributaries.

Most of the native species are deciduous. American elm, American plum, boxelder, common chokecherry, green ash, peachleaf willow, plains cottonwood, sandbox willow, western snowberry, and several species of wild rose are on bottom lands along the White River. These species and bur oak, silver buffaloberry, and wild grape are on bottom lands along the Keya Paha River. Scattered clumps and stringers of trees and shrubs also are along some of the drainageways throughout the county. A unique stand of ponderosa pine and red cedar is on Turtle Butte.

The early settlers used the native trees as a source of building materials, fence posts, and fuel. Buffaloberries, chokecherries, and plums were a source of fresh fruit or were used in jams and jellies. Today native trees and shrubs are valued mainly for livestock protection, wildlife habitat, recreation, and watershed protection.

Windbreaks have been planted since the time of the early settlers. The early plantings were made mainly for the protection of the farmstead and of livestock.

[6] By DAVID L. HINTZ, forester, Soil Conservation Service .

These types of plantings still are needed. In recent years field windbreaks have been planted to help to control soil blowing. Thousands of acres in the survey area still need windbreaks.

Windbreaks are established to protect livestock, buildings, and yards from wind and snow. They also help protect fruit trees and gardens, and they furnish wildlife habitat. Several rows of broad-leaved and coniferous species provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on erodibility of the soil. These windbreaks protect cropland and crops from wind and hold snow on the fields. They also provide food and cover for wildlife.

Environmental plantings help to beautify and screen homes and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. Healthy stock of suitable species planted properly on a well prepared site and maintained in good condition can insure a high degree of plant survival.

Table 4 shows the height that locally adapted trees and shrubs are expected to reach on various kinds of soils in 20 years. The estimates in table 4, based on measurements and observation of established plantings that have been given adequate care, can be used as a guide in planning windbreaks and screens. Additional information about planning windbreaks and screens and the planting and care of trees can be obtained from the local office of the Soil Conservation Service, the Extension Service, or local nurserymen.

Wildlife[7]

Wildlife is a product of the soil, and like other crops, it responds to good management. The level of production of adapted wildlife generally is in balance with essential habitat, which contains food and cover. The nature and adequacy of habitat plants, introduced and native, depend on the suitability of the soil for growing the plants. The complete habitat elements needed by a specific species of wildlife generally require several kinds of soil and commonly a combination of land uses.

If the soils have potential, wildlife habitat can be created or improved by planting appropriate vegetation, by properly managing the existing plant cover, and by fostering the natural establishment of desirable plants.

In table 5 the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning the use of parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; determining the intensity of management needed for each element of the habitat; and determining areas that are suitable for acquisition to manage for wildlife.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained; few or no limitations affect management; and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places, but moderate intensity of management and fairly frequent attention are required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat; habitat can be created, improved, or maintained in most places, but management is difficult and requires intensive effort. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected; wildlife habitat is impractical or even impossible to create or improve on soils having such a rating; natural habitat can be maintained on these soils, but management is difficult and requires intensive effort.

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

Grain and seed crops are seed-producing annuals used by wildlife. Examples are corn, sorghum, wheat, oats, and barley. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, and flood hazard. Soil temperature and moisture are also considerations.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Examples are smooth bromegrass, sweet clover, alfalfa, and intermediate wheatgrass. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, flood hazard, and slope. Soil temperature and moisture are also considerations.

Wild herbaceous plants are native plant communities that provide food and cover for wildlife. These communities generally occur naturally but may be established culturally. They include grasses, forbs, and sedges. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, and flood hazard. Soil temperature and moisture are also considerations.

Hardwood trees are planted woodlands that provide food and cover for wildlife. Examples of these plants are American plum, common chokecherry, silver buffaloberry, Russian-olive, and green ash. Major soil properties that affect growth of hardwood trees are depth of the root zone, available water capacity, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Examples of wetland plants are smartweed, wild millet, rushes, sedges, reeds, saltgrass, cordgrass, and cattail. Major soil properties that affect wetland plants are texture of the surface layer, wetness, reaction, salinity, and slope.

Shallow water areas are bodies of surface water that have an average depth of less than 8 feet and are

[7] By JOHN B. FARLEY, biologist, Soil Conservation Service.

TABLE 4.—*Windbreaks and environmental plantings*

[Absence of an entry means soil does not normally grow trees of this height class]

Soil name and map symbol	Trees having predicted 20-year average heights of—				
	Less than 8 feet	8 to 15 feet	16 to 25 feet	26 to 35 feet	More than 35 feet
Anselmo: AaB2, AbB, AbC	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.		
AbD					
[1] AhC:					
Anselmo part	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.		
Holt part	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.		
[1] AtD					
[1] AvA:					
Anselmo part	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.		
Vetal part		Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
Bankard: [1] Ba		Ponderosa pine, eastern redcedar, Rocky Mt. juniper.			
Boro: [1] BmC:					
Boro part	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Russian-olive, eastern redcedar.		
Millboro part	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Russian-olive, eastern redcedar.		
Boyd: BnC	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Russian-olive, eastern redcedar.		
[1] BOD					

TABLE 4.—*Windbreaks and environmental plantings*—Continued

Soil name and map symbol	Trees having predicted 20-year average heights of—				
	Less than 8 feet	8 to 15 feet	16 to 25 feet	26 to 35 feet	More than 35 feet
Bridgeport:					
Bp		Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
Bt					
Canning:					
CaB	Siberian peashrub, Tatarian honeysuckle, silver buffaloberry, Peking cotoneaster, lilac.	Ponderosa pine, green ash, Siberian crabapple, hackberry, Russian-olive, eastern redcedar.	Siberian elm		
[1] CbD					
Carter:					
Cc	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.			
Cass:					
Cd		Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
Chappell:					
ChA	Siberian peashrub, Tatarian honeysuckle, silver buffaloberry, Peking cotoneaster, lilac.	Ponderosa pine, green ash, Siberian crabapple, hackberry, Russian-olive, eastern redcedar.	Siberian elm		
[1] CnC					
Dix:					
DaA, [1] DbD					
Doger:					
DgB	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.		
[1] DmA:					
Doger part	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.		
Elsmere part	American plum, lilac.	Common chokecherry, Siberian peashrub, eastern redcedar.	Green ash, hackberry, Siberian crabapple, blue spruce, ponderosa pine.	Golden willow, eastern cottonwood.	
Dunday:					
DnC2		Ponderosa pine, eastern redcedar, Rocky Mt. juniper.			

TABLE 4.—*Windbreaks and environmental plantings*—Continued

Soil name and map symbol	Trees having predicted 20-year average heights of—				
	Less than 8 feet	8 to 15 feet	16 to 25 feet	26 to 35 feet	More than 35 feet
[1] DuC: Dunday part		Ponderosa pine, eastern redcedar, Rocky Mt. juniper.			
Doger part	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.		
Elsmere: Em	American plum, lilac.	Common chokecherry, Siberian peashrub, eastern redcedar.	Green ash, hackberry, Siberian crabapple, blue spruce, ponderosa pine.	Golden willow, eastern cottonwood.	
Epping: EpE					
Erd: Er	Lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Hackberry, blue spruce, green ash, ponderosa pine, Siberian crabapple.	Eastern cottonwood, golden willow.	
[1] Es					
Haverson: Ha		Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
Holt: [1] HbA: Holt part	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.		
Anselmo part	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.		
Huggins: HgA	Siberian peashrub, silver buffaloberry, American plum, Peking cotoneaster, lilac.	Green ash, Rocky Mt. juniper, Russian-olive, Siberian crabapple, common chokecherry.	Siberian elm, ponderosa pine.		
[1] HkB: Huggins part	Siberian peashrub, silver buffaloberry, American plum, Peking cotoneaster, lilac.	Green ash, Rocky Mt. juniper, Russian-olive, Siberian crabapple, common chokecherry.	Siberian elm, ponderosa pine.		
Kadoka part	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	

TABLE 4.—*Windbreaks and environmental plantings*—Continued

Soil name and map symbol	Trees having predicted 20-year average heights of—				
	Less than 8 feet	8 to 15 feet	16 to 25 feet	26 to 35 feet	More than 35 feet
Hurley:					
Hr					
Inavale:					
Ia		Ponderosa pine, eastern redcedar, Rocky Mt. juniper.			
[1] Ic					
Kadoka:					
KaA	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	
[1] KbD:					
Kadoka part	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	
Epping part					
Keya:					
Ke		Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
Kolls:					
Ko					
Lakoma:					
[1] LkC:					
Lakoma part	Siberian peashrub, silver buffaloberry, American plum, Peking cotoneaster, lilac.	Green ash, Rocky Mt. juniper, Russian-olive, Siberian crabapple, common chokecherry.	Siberian elm, ponderosa pine.		
Millboro part	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Russian-olive, eastern redcedar.		
[1] LoD					
Lowry:					
LwA	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	
Manter:					
MaA, MaB	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.		
[1] MfE					

TABLE 4.—*Windbreaks and environmental plantings*—Continued

Soil name and map symbol	Trees having predicted 20-year average heights of—				
	Less than 8 feet	8 to 15 feet	16 to 25 feet	26 to 35 feet	More than 35 feet
Marsh: Mh					
Millboro: MoA, MoB, MoC	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Russian-olive, eastern redcedar.		
Mosher: Mr	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.			
[1] Ms: Mosher part	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.			
Jerauld part					
Munjor: Mu		Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
Okaton: [1] OAF, OBE, [1] OcF					
Onita: On		Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
[1] Oo: Onita part		Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
Mosher part	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.			
Opal: OpC	Siberian peashrub, silver buffaloberry, American plum, Peking cotoneaster, lilac.	Green ash, Rocky Mt. juniper, Russian-olive, Siberian crabapple, common chokecherry.	Siberian elm, ponderosa pine.		
[1] OsE					
Orwet: Ow	American plum, lilac.	Common chokecherry, Siberian peashrub, eastern redcedar.	Green ash, hackberry, Siberian crabapple, blue spruce, ponderosa pine.	Golden willow, eastern cottonwood.	

TABLE 4.—*Windbreaks and environmental plantings*—Continued

Soil name and map symbol	Trees having predicted 20-year average heights of—				
	Less than 8 feet	8 to 15 feet	16 to 25 feet	26 to 35 feet	More than 35 feet
Promise: PrA, PrB, PrC	Siberian peashrub, silver buffaloberry, American plum, Peking cotoneaster, lilac.	Green ash, Rocky Mt. juniper, Russian-olive, Siberian crabapple, common chokecherry.	Siberian elm, ponderosa pine.		
PsA					
PtA	Siberian peashrub, silver buffaloberry, American plum, Peking cotoneaster, lilac.	Green ash, Rocky Mt. juniper, Russian-olive, Siberian crabapple, common chokecherry.	Siberian elm, ponderosa pine.		
Ree: RaA, RaB, RaC, RaD	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	
Reliance: ReA, ReB, ReC, ReC2	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	
Ronson: RfA	Tatarian honeysuckle, American plum, lilac, Peking cotoneaster.	Ponderosa pine, Russian-olive, green ash, hackberry, Rocky Mt. juniper, eastern redcedar, Siberian peashrub.	Siberian elm		
[1] RoB: Ronson part	Tatarian honeysuckle, American plum, lilac, Peking cotoneaster.	Ponderosa pine, Russian-olive, green ash, hackberry, Rocky Mt. juniper, eastern redcedar, Siberian peashrub.	Siberian elm		
Tassel part					
Rosebud: RsB	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	
[1] RuC: Rosebud part	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	
Canyon part					

TABLE 4.—*Windbreaks and environmental plantings*—Continued

Soil name and map symbol	Trees having predicted 20-year average heights of—				
	Less than 8 feet	8 to 15 feet	16 to 25 feet	26 to 35 feet	More than 35 feet
[1] RuD:					
Rosebud part	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	
Canyon part					
Sansarc:					
[1] SAE, ScF					
Schamber:					
[1] ShE					
Scott:					
So					
Shena:					
SsB					
Swanboy:					
Sw					
Tassel:					
TaE, TrF					
Valentine:					
VaD		Ponderosa pine, eastern redcedar, Rocky Mt. juniper.			
[1] VdC:					
Valentine part		Ponderosa pine, eastern redcedar, Rocky Mt. juniper.			
Dunday part		Ponderosa pine, eastern redcedar, Rocky Mt. juniper.			
[1] VnD:					
Valentine part		Ponderosa pine, eastern redcedar, Rocky Mt. juniper.			
Tassel part					
Vetal:					
Vt		Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
Wanblee:					
[1] Wa:					
Wanblee part					
Wortman part	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.			
Wann:					
Wb	American plum, lilac.	Common chokecherry, Siberian peashrub, eastern redcedar.	Green ash, hackberry, Siberian crabapple, blue spruce, ponderosa pine.	Golden willow, eastern cottonwood.	

TABLE 4.—*Windbreaks and environmental plantings*—Continued

Soil name and map symbol	Trees having predicted 20-year average heights of—				
	Less than 8 feet	8 to 15 feet	16 to 25 feet	26 to 35 feet	More than 35 feet
Westover: WeE					
Wewela: WfA, WgA, WgB	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Russian-olive, eastern redcedar.		
Whitelake: Wh	American plum, silver buffaloberry, lilac.	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub.	Siberian elm, ponderosa pine, bur oak, Russian-olive.		
[1] Wk: Whitelake part	American plum, silver buffaloberry, lilac.	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub.	Siberian elm, ponderosa pine, bur oak, Russian-olive.		
Lute part					
Witten: Wn	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Russian-olive, eastern redcedar.		
Wortman: Wo	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.			

[1] This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control devices in marshes. Examples are marshes, waterfowl feeding areas, wildlife watering developments, and beaver ponds. Major soil properties that affect shallow water areas are depth to bedrock, wetness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland wildlife consists of animals that frequent cropland, pasture, meadows, and planted woodland. These animals use other areas, such as natural woodland and heavily vegetated marsh, but they are closely associated with cultivated areas. The kinds of wildlife attracted to these areas include bobwhite quail, pheasant, mourning dove, meadowlark, robin, cottontail, jackrabbit, fox squirrel, raccoon, red fox, and whitetail deer.

Wetland wildlife consists of animals that frequent open, marshy, or shallow water areas. Examples of wildlife attracted to this habitat are ducks, geese, coot, herons, shore birds, red-winged blackbird, muskrat, mink, and beaver.

Rangeland wildlife consists of animals that are in extensive areas of native grassland. Examples of wildlife attracted to this habitat are prairie chicken, sharp-tailed grouse, mourning dove, magpie, horned lark, lark bunting, mule deer, whitetail deer, prong-horned antelope, coyote, red fox, bobcat, jackrabbit, and prairie dog.

TABLE 5.—*Wildlife*

[See text for definitions of "good," "fair," "poor," and "very

Soil name and map symbol	Potential for habitat elements			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees
Anselmo:				
AaB2	Very poor	Poor	Good	Poor
AbB, AbC	Fair	Fair	Good	Fair
AbD	Very poor	Poor	Good	Poor
[1] AhC:				
Anselmo part	Fair	Fair	Good	Fair
Holt part	Poor	Fair	Good	Fair
[1] AtD:				
Anselmo part	Very poor	Poor	Good	Poor
Tassel part	Very poor	Very poor	Fair	Poor
[1] AvA:				
Anselmo part	Fair	Fair	Good	Fair
Vetal part	Fair	Fair	Good	Good
Bankard:				
[1] Ba	Very poor	Very poor	Fair	Poor
Boro:				
[1] BmC:				
Boro part	Poor	Fair	Good	Fair
Millboro part	Poor	Fair	Good	Fair
Boyd:				
BnC	Poor	Fair	Good	Fair
[1] BOD:				
Boyd part	Very poor	Poor	Good	Poor
Okaton part	Very poor	Very poor	Fair	Very poor
Bridgeport:				
Bp	Good	Good	Fair	Good
Bt	Very poor	Good	Fair	Poor
Canning:				
CaB	Fair	Fair	Good	Poor
[1] CbD:				
Canning part	Very poor	Very poor	Good	Poor
Murdo part	Very poor	Very poor	Poor	Poor
Carter:				
Cc	Poor	Poor	Poor	Poor
Cass:				
Cd	Fair	Fair	Good	Good
Chappell:				
ChA	Fair	Fair	Good	Poor
[1] CnC:				
Chappell part	Very poor	Poor	Good	Poor
Dix part	Very poor	Very poor	Poor	Poor
Dix:				
DaA, [1] DbD	Very poor	Very poor	Poor	Poor
Doger:				
DgB	Poor	Fair	Good	Fair
[1] DmA:				
Doger part	Poor	Fair	Good	Fair
Elsmere part	Poor	Good	Fair	Good
Dunday:				
DnC2	Very poor	Poor	Fair	Poor

habitat potentials

poor." Absence of an entry indicates the soil was not rated]

Potential for habitat elements—Cont.		Potential as habitat for—		
Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Very poor	Very poor	Very poor	Very poor	Good.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Good.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Good	Very poor	Fair.
Very poor	Very poor	Poor	Very poor	Fair.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Poor.
Very poor	Fair	Poor	Poor	Poor.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Poor.
Very poor	Very poor	Very poor	Very poor	Poor.
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Good.
Poor	Poor	Fair	Poor	Fair.
Very poor	Very poor	Very poor	Very poor	Fair.

TABLE 5.—*Wildlife habitat*

Soil name and map symbol	Potential for habitat elements			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees
[1] DuC:				
Dunday part	Very poor	Poor	Fair	Poor
Doger part	Poor	Fair	Good	Fair
Elsmere:				
Em	Poor	Good	Fair	Good
Epping:				
EpE	Very poor	Very poor	Fair	Poor
Erd:				
Er	Fair	Fair	Good	Fair
[1] Es:				
Erd part	Fair	Fair	Good	Fair
Hurley part	Very poor	Very poor	Poor	Poor
Haverson:				
Ha	Good	Fair	Fair	Good
Holt:				
[1] HbA:				
Holt part	Fair	Fair	Good	Fair
Anselmo part	Fair	Fair	Good	Fair
Huggins:				
HgA	Fair	Fair	Good	Fair
[1] HkB:				
Huggins part	Fair	Fair	Good	Fair
Kadoka part	Fair	Good	Good	Good
Hurley:				
Hr	Very poor	Very poor	Poor	Poor
Inavale:				
Ia	Poor	Fair	Fair	Poor
[1] Ic	Very poor	Fair	Fair	Poor
Kadoka:				
KaA	Good	Good	Good	Good
[1] KbD:				
Kadoka part	Poor	Good	Good	Poor
Epping part	Very poor	Very poor	Fair	Poor
Keya:				
Ke	Good	Good	Fair	Good
Kolls:				
Ko	Very poor	Poor	Poor	Fair
Lakoma:				
[1] LkC:				
Lakoma part	Poor	Fair	Good	Fair
Millboro part	Poor	Fair	Good	Fair
[1] LoD:				
Lakoma part	Very poor	Very poor	Good	Poor
Okaton part	Very poor	Very poor	Fair	Poor
Lowry:				
LwA	Good	Good	Good	Good
Manter:				
MaA, MaB	Fair	Fair	Good	Poor
[1] MfE:				
Manter part	Very poor	Poor	Good	Poor
Anselmo part	Very poor	Poor	Good	Very poor

potentials—Continued

Potential for habitat elements—Cont.		Potential as habitat for—		
Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Poor	Very poor	Good.
Poor	Poor	Fair	Poor	Fair.
Very poor	Very poor	Very poor	Very poor	Fair.
Poor	Poor	Fair	Poor	Good.
Poor	Poor	Fair	Poor	Good.
Very poor	Very poor	Very poor	Very poor	Poor.
Very poor	Very poor	Good	Very poor	Fair.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Good	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Poor.
Very poor	Very poor	Poor	Very poor	Fair.
Very poor	Very poor	Poor	Very poor	Fair.
Very poor	Very poor	Good	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Good	Very poor	Fair.
Fair	Fair	Very poor	Fair	Poor.
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Good	Very poor	Good.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Good.

TABLE 5.—*Wildlife habitat*

Soil name and map symbol	Potential for habitat elements			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees
Marsh:				
Mh	Very poor	Very poor	Very poor	Very poor
Millboro:				
MoA, MoB	Fair	Fair	Good	Fair
MoC	Poor	Fair	Good	Fair
Mosher:				
Mr	Poor	Poor	Poor	Poor
[1] Ms:				
Mosher part	Poor	Poor	Poor	Poor
Jerauld part	Very poor	Very poor	Poor	Poor
Munjor:				
Mu	Fair	Fair	Fair	Good
Okaton:				
[1] OAF	Very poor	Very poor	Fair	Poor
[1] OBE:				
Okaton part	Very poor	Very poor	Fair	Poor
Lakoma part	Very poor	Very poor	Good	Poor
[1] OcF:				
Okaton part	Very poor	Very poor	Fair	Poor
Rock outcrop part.				
Onita:				
On	Good	Good	Fair	Good
[1] Oo:				
Onita part	Good	Good	Fair	Good
Mosher part	Poor	Poor	Poor	Poor
Opal:				
OpC	Poor	Fair	Good	Fair
[1] OsE:				
Opal part	Very poor	Very poor	Good	Poor
Sansarc part	Very poor	Very poor	Fair	Poor
Orwet:				
Ow	Poor	Good	Fair	Good
Promise:				
PrA, PrB	Fair	Fair	Good	Fair
PrC	Poor	Fair	Good	Fair
PsA	Very poor	Fair	Fair	Poor
PtA	Fair	Fair	Good	Fair
Ree:				
ReA, ReB	Good	Good	Good	Good
ReC	Fair	Good	Good	Fair
ReD	Poor	Good	Good	Poor
Reliance:				
ReA, ReB	Good	Good	Good	Good
ReC	Fair	Good	Good	Fair
ReC2	Poor	Good	Good	Fair
Ronson:				
RfA	Fair	Fair	Good	Poor
[1] RoB:				
Ronson part	Fair	Fair	Good	Poor
Tassel part	Very poor	Very poor	Fair	Poor
Rosebud:				
RsB	Good	Good	Good	Good

potentials—Continued

Potential for habitat elements—Cont.		Potential as habitat for—		
Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Good	Good	Very poor	Good	Very poor.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Poor.
Very poor	Very poor	Poor	Very poor	Poor.
Poor	Poor	Very poor	Poor	Poor.
Very poor	Very poor	Fair	Very poor	Fair.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Very poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Good	Very poor	Fair.
Very poor	Very poor	Good	Very poor	Fair.
Very poor	Very poor	Poor	Very poor	Poor.
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Fair.
Poor	Poor	Fair	Poor	Fair.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Good	Very poor	Good.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Good	Very poor	Good.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Fair	Very poor	Fair.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Good	Very poor	Good.

TABLE 5.—*Wildlife habitat*

Soil name and map symbol	Potential for habitat elements			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees
[1] RuC:				
Rosebud part	Fair	Good	Good	Fair
Canyon part	Very poor	Very poor	Fair	Poor
[1] RuD:				
Rosebud part	Poor	Good	Good	Poor
Canyon part	Very poor	Very poor	Fair	Poor
Sansarc:				
[1] SAE:				
Sansarc part	Very poor	Very poor	Fair	Poor
Opal part	Very poor	Very poor	Good	Poor
[1] ScF:				
Sansarc part	Very poor	Very poor	Fair	Poor
Shale outcrop part.				
Schamber:				
[1] ShE:				
Schamber part	Very poor	Very poor	Poor	Poor
Murdo part	Very poor	Very poor	Poor	Poor
Scott:				
So	Poor	Poor	Poor	Poor
Shena:				
SsB	Very poor	Very poor	Good	Poor
Swanboy:				
Sw	Very poor	Very poor	Poor	Poor
Tassel:				
TaE	Very poor	Very poor	Fair	Poor
[1] TrF:				
Tassel part	Very poor	Very poor	Fair	Poor
Rock outcrop part.				
Valentine:				
VaD	Very poor	Very poor	Fair	Poor
[1] VdC:				
Valentine part	Very poor	Very poor	Fair	Poor
Dunday part	Very poor	Poor	Fair	Poor
[1] VnD:				
Valentine part	Very poor	Very poor	Fair	Poor
Tassel part	Very poor	Very poor	Fair	Poor
Vetal:				
Vt	Fair	Fair	Good	Good
Wanblee:				
[1] Wa:				
Wanblee part	Very poor	Very poor	Poor	Poor
Wortman part	Poor	Poor	Poor	Poor
Wann:				
Wb	Fair	Good	Fair	Good
Westover:				
WeE	Very poor	Very poor	Fair	Poor
Wewela:				
WgA, WgB	Fair	Fair	Good	Fair
WfA	Poor	Fair	Good	Fair
Whitelake:				
Wh	Poor	Fair	Good	Fair

potentials—Continued

Potential for habitat elements—Cont.		Potential as habitat for—		
Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Very poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Very poor	Very poor	Poor.
Very poor	Very poor	Very poor	Very poor	Poor.
Fair	Fair	Poor	Fair	Poor.
Very poor	Very poor	Very poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Poor.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Poor.
Very poor	Very poor	Poor	Very poor	Poor.
Poor	Poor	Good	Poor	Fair.
Very poor	Very poor	Very poor	Very poor	Fair.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Good.

TABLE 5.—*Wildlife habitat*

Soil name and map symbol	Potential for habitat elements			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees
[1] Wk:				
Whitelake part	Poor	Fair	Good	Fair
Lute part	Very poor	Very poor	Fair	Poor
Witten:				
Wn	Fair	Fair	Good	Fair
Wortman:				
Wo	Poor	Poor	Poor	Poor

[1] This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

Engineering [8]

This section provides information about the use of soils for building sites, sanitary facilities, construction materials, and water management. Among those who can benefit from this section are engineers, landowners, community decision makers and planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in tables in this section are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between soil properties and soil behavior in various engineering uses.

Among the soil properties and site conditions identified by the soil survey and used in determining the ratings in this section are grain-size distribution, liquid limit, plasticity index, soil reaction, depth to and hardness of bedrock within 5 or 6 feet of the surface, soil wetness characteristics, depth to a seasonal water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

Based on the information assembled about soil properties, ranges of values may be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values may be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The information can be used to—

(1) select potential residential, commercial, industrial, and recreational areas.

(2) make preliminary estimates pertinent to construction in a particular area.

(3) evaluate alternate routes for roads, streets, highways, pipelines, and underground cables.

(4) evaluate alternate sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities.

(5) plan detailed onsite investigations of soils and geology.

(6) find sources of gravel, sand, clay, and topsoil.

(7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation.

(8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted.

(9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Information presented in this section is useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of this information, however, should be well understood. First, the soils generally are not rated below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, this survey does not eliminate the need for onsite investigations and testing.

The information is presented mainly in tables. Table 6 shows, for each kind of soil, ratings of the degree and kind of limitations for building site development; table 7, for sanitary facilities; and table 9, for water management. Table 8 shows the suitability for each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific land uses.

Some of the terms used in this soil survey have

[8] LEROY MERNAUGH, agricultural engineer, Soil Conservation Service, helped to prepare this section.

potentials—Continued

Potential for habitat elements—Cont.		Potential as habitat for—		
Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Very poor Poor	Very poor Poor	Poor Very poor	Very poor Very poor	Good. Fair.
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Poor.

different meanings in soil science and in engineering; the Glossary defines many of these terms.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 6. A *slight* limitation indicates that soil properties are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are used for pipelines, sewerlines, telephone and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by the soil wetness of a high seasonal water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and by the hazard of flooding. Ratings do not apply to soil horizons below 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is defined, and the presence of very firm or extremely firm horizons, generally difficult to excavate, is indicated.

Dwellings and small commercial buildings, referred to in table 6, are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence from settling or shear failure of the foundation do not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and the large stones in or on the soil also are important in choosing the sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious limitation.

Local roads and streets, referred to in table 6, have an all-weather surface that can carry light to medium traffic all year. They consist of subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil, as well as the quantity and workability of fill material available, are important in the design and construction of roads and streets. The AASHTO and Unified soil classifications and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation and were also considered.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that deal with the ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 7 shows the degree and kind of limitations of each soil for these uses and as daily cover for landfill.

If the degree of soil limitation is indicated by the

TABLE 6.—*Building site development*

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Anselmo:					
AaB2, AbB, AbC	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action, low strength.
AbD	Moderate: slope	Moderate: slope.	Moderate: slope.	Severe: slope	Moderate: slope, frost action, low strength.
[1] AhC:					
Anselmo part	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action, low strength.
Holt part	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action, low strength.
[1] AtD:					
Anselmo part	Severe: slope, depth to rock.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Tassel part	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
[1] AvA:					
Anselmo part	Slight	Slight	Slight	Slight	Moderate: frost action, low strength.
Vetal part	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods.
Bankard:					
[1] Ba	Severe: cutbanks cave, floods.	Severe: floods	Severe: floods	Severe: floods	Severe: floods.
Boro:					
[1] BmC:					
Boro part	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Millboro part	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Boyd:					
BnC	Moderate: too clayey, depth to rock.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
[1] BOD:					
Boyd part	Moderate: slope, too clayey, depth to rock.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
Okaton part	Severe: slope, depth to rock.	Severe: shrink-swell, slope. low strength.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.
Bridgeport:					
Bp	Slight	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.
Bt	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods.
Canning:					
CaB	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.

TABLE 6.—*Building site development*—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
[1] CbD:					
Canning part	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Murdo part	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope	Moderate: slope.
Carter:					
Cc	Severe: dense layer.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Cass:					
Cd	Severe: cutbanks cave.	Severe: floods	Severe: floods	Severe: floods	Moderate: frost action, floods.
Chappell:					
ChA	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
[1] CnC:					
Chappell part	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Dix part	Severe: small stones, cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Dix:					
DaA	Severe: small stones, cutbanks cave.	Slight	Slight	Slight	Slight.
[1] DbD	Severe: small stones, cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope	Moderate: slope.
Doger:					
DgB	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
[1] DmA:					
Doger part	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Elsmere part	Severe: wetness, cutbanks cave.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Moderate: wetness, frost action.
Dunday:					
DnC2	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
[1] DuC:					
Dunday part	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Doger part	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Elsmere:					
Em	Severe: wetness, cutbanks cave.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Moderate: wetness, frost action.
Epping:					
EpE	Severe: slope, depth to rock.	Severe: slope	Severe: slope, depth to rock.	Severe: slope	Severe: slope.

TABLE 6.—*Building site development*—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Erd: Er	Moderate: too clayey, wetness.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength, floods.
[1] Es: Erd part	Severe: too clayey, floods, wetness.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength, floods.
Hurley part	Severe: dense layer.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Haverson: Ha	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods.
Holt: [1] HbA: Holt part	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Slight	Moderate: frost action, low strength.
Anselmo part	Slight	Slight	Slight	Slight	Moderate: frost action, low strength.
Huggins: HgA	Moderate: depth to rock.	Moderate: shrink-swell, low strength.	Moderate: depth to rock.	Moderate: shrink-swell, low strength.	Severe: shrink-swell, low strength.
[1] HkB: Huggins part	Moderate: depth to rock.	Moderate: shrink-swell, low strength.	Moderate: depth to rock.	Moderate: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Kadoka part	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Severe: low strength.
Hurley: Hr	Severe: dense layer.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Inavale: Ia, [1] Ic	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods.
Kadoka: KaA	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Slight	Severe: low strength.
[1] KbD: Kadoka part	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope	Severe: low strength.
Epping part	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Severe: slope	Moderate: depth to rock, slope.
Keya: Ke	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods.
Kolls: Ko	Severe: wetness, floods.	Severe: shrink-swell, floods, wetness.	Severe: shrink-swell, floods, wetness.	Severe: shrink-swell, floods, wetness.	Severe: shrink-swell, low strength, floods.

TABLE 6.—*Building site development*—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Lakoma:					
[1] LkC:					
Lakoma part	Moderate: too clayey, depth to rock.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Millboro part	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
[1] LoD:					
Lakoma part	Moderate: too clayey, depth to rock.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.
Okaton part	Moderate: too clayey, depth to rock.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength.
Lowry:					
LwA	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: frost action, low strength.
Manter:					
MaA	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength, frost action.
MaB	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength, frost action.
[1] MfE:					
Manter part	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Anselmo part	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Marsh:					
Mh.					
Millboro:					
MoA, MoB, MoC	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Mosher:					
Mr	Slight	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
[1] Ms:					
Mosher part	Slight	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Jerauld part	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Munjor:					
Mu	Severe: cutbanks cave.	Severe: floods	Severe: floods	Severe: floods	Moderate: low strength, floods.
Okaton:					
[1] OAF	Severe: slope, depth to rock.	Severe: shrink-swell, slope, low strength.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.

TABLE 6.—*Building site development*—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
[1] OBE: Okaton part	Severe: slope, depth to rock.	Severe: shrink-swell, slope, low strength.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.
Lakoma part	Severe: slope, too clayey.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
[1] OcF: Okaton part	Severe: slope, depth to rock.	Severe: shrink-swell, slope, low strength.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.
Rock outcrop part.					
Onita: On	Severe: floods	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell, low strength.
[1] Oo: Onita part	Severe: floods	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell, low strength.
Mosher part	Slight	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Opal: OpC	Moderate: too clayey, depth to rock.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
[1] OsE: Opal part	Severe: slope, too clayey.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
Sansarc part	Severe: slope, too clayey.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
Orwet: Ow	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Promise: PrA, PrB, PrC	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
PsA	Moderate: too clayey, floods.	Severe: shrink-swell, low strength, floods.	Severe: shrink-swell, floods, low strength.	Severe: shrink-swell, floods, low strength.	Severe: shrink-swell, low strength.
PtA	Severe: too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength.
Ree: ReA	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: low strength, frost action, shrink-swell.

TABLE 6.—*Building site development*—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
RaB, RaC	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength, slope.	Moderate: low strength, shrink-swell, frost action.
RaD	Moderate: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: shrink-swell, low strength, slope.	Severe: slope	Moderate: low strength, shrink-swell, frost action.
Reliance: ReA, ReB, ReC, ReC2	Slight	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Ronson: RfA	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Slight	Moderate: low strength, frost action.
[1] RoB: Ronson part	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Slight	Moderate: low strength, frost action.
Tassel part	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.
Rosebud: RsB	Moderate: depth rock.	Moderate: shrink-swell.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.
[1] RuC: Rosebud part	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.
Canyon part	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.
[1] RuD: Rosebud part	Moderate: depth to rock, slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, depth to rock, slope.	Severe: slope	Moderate: shrink-swell, frost action.
Canyon part	Severe: depth to rock, slope.	Moderate: depth to rock, slope.	Severe: depth to rock.	Severe: slope	Moderate: depth to rock, slope.
Sansarc: [1] SAE: Sansarc part	Severe: slope, too clayey.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
Opal part	Severe: slope, too clayey.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
[1] ScF: Sansarc part	Severe: slope, too clayey.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
Shale outcrop part.					
Schamber: [1] ShE: Schamber part	Severe: slope, cutbanks cave.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.

TABLE 6.—*Building site development*—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Murdo part	Severe: cutbanks cave, slope.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Scott: So	Severe: floods, too clayey, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.
Shena: SsB	Severe: too clayey, depth to rock.	Severe: shrink-swell, low strength.	Severe: shrink-swell, depth to rock, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Swanboy: Sw	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Tassel: TaE	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
[1] TrF: Tassel part	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Rock outcrop part.					
Valentine: VaD	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope	Moderate: slope.
[1] VdC: Valentine part	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Dunday part	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
[1] VnD: Valentine part	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope	Moderate: slope.
Tassel part	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Severe: slope	Moderate: depth to rock.
Vetal: Vt	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods.
Wanblee: [1] Wa: Wanblee part	Moderate: too clayey, depth to rock.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Wortman part	Moderate: too clayey, depth to rock.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength, depth to rock.	Moderate: shrink-swell, low strength.	Severe: low strength.
Wann: Wb	Severe: wetness, floods.	Severe: floods	Severe: floods, wetness.	Severe: floods	Severe: floods, frost action.
Westover: WeE	Severe: cutbanks cave, slope.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Wewela: WfA, WgA, WgB	Moderate: too clayey, depth to rock.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.

TABLE 6.—*Building site development*—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Whitelake: Wh	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: frost action.
[1] Wk: Whitelake part	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: frost action.
Lute part	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.
Witten: Wn	Severe: floods	Severe: shrink-swell, floods, low strength.	Severe: shrink-swell, floods, low strength.	Severe: shrink-swell, floods, low strength.	Severe: shrink-swell, floods, low strength.
Wortman: Wo	Moderate: depth to rock.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength, depth to rock.	Moderate: shrink-swell, low strength.	Severe: low strength.

[1] This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

rating *slight,* soils are favorable for the specified use and limitations are minor and easily overcome; if *moderate,* soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe,* soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special design, or intensive maintenance is required.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and the construction of the system.

Properties and features that affect the absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and a shallow depth to bedrock interfere with installation. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas. Also, soil erosion and soil slippage are hazards where absorption fields are installed in sloping soils.

Some soils are underlain by loose sand and gravel or fractured bedrock less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and, as a result, ground water supplies in the area may be contaminated.

Percolation tests are performed to determine the absorptive capacity of the soil and its suitability for septic tank absorption fields. These tests should be performed during the season when the water table is highest and the soil is at minimum absorptive capacity.

In many of the soils that have moderate or severe limitations for septic tank absorption fields, it may be possible to install special systems that lower the seasonal water table or to increase the size of the absorption field so that satisfactory performance is achieved.

Sewage lagoons are shallow ponds constructed to hold sewage while bacteria decompose the solid and liquid wastes. Lagoons have a nearly level flow area surrounded by cut slopes or embankments of compacted, nearly impervious soil material. They generally are designed so that depth of the sewage is 2 to 5 feet. Impervious soil at least 4 feet thick for the lagoon floor and sides is required to minimize seepage and contamination of local ground water. Soils that are very high in organic matter and those that have stones and boulders are undesirable. Unless the soil has very slow permeability, contamination of local ground water is a hazard in areas where the seasonal high water table is above the level of the lagoon floor. In soils where there is a seasonal high water table, seepage of ground water into the lagoon can seriously reduce its capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the location of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soils affect the performance of embankments.

Sanitary landfill is a method of disposing solid waste, either in excavated trenches or on the surface of the soil. The waste is spread, compacted in layers, and covered with thin layers of soil. Landfill areas are subject to heavy vehicular traffic. Ease of excavation, risk of polluting ground water, and trafficability affect the suitability of a soil for this use. The best soils are loamy or silty, have moderate or slow permeability, are deep to bedrock and a seasonal water table, are free of large stones and boulders, and are not subject to flooding. In areas where the seasonal water table is high, water seeps into the trenches and causes

TABLE 7.—*Sanitary facilities*

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils. Absence of an entry means soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Anselmo:					
AaB2, AbB, AbC	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Good.
AbD	Moderate: slope.	Severe: seepage, slope.	Severe: seepage	Severe: seepage	Fair: slope.
[1] AhC:					
Anselmo part	Slight	Severe: seepage, slope.	Severe: seepage	Severe: seepage	Good.
Holt part	Severe: depth to rock.	Severe: seepage, slope.	Severe: depth to rock, seepage.	Severe: seepage	Poor: area reclaim.
[1] AtD:					
Anselmo part	Severe: slope	Severe: seepage, slope.	Severe: seepage	Severe: seepage, slope.	Poor: slope.
Tassel part	Severe: slope, depth to rock.	Severe: depth to rock, slope, seepage.	Severe: depth to rock, seepage.	Severe: seepage, slope, depth to rock.	Poor: slope, area reclaim.
[1] AvA:					
Anselmo part	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Good.
Vetal part	Severe: floods	Severe: seepage	Severe: seepage, floods.	Severe: seepage, floods.	Good.
Bankard:					
[1] Ba	Severe: floods	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods	Fair: too sandy.
Boro:					
[1] BmC:					
Boro part	Severe: percs slowly.	Severe: slope	Severe: too clayey.	Slight	Poor: too clayey.
Millboro part	Severe: percs slowly.	Severe: slope	Severe: too clayey.	Slight	Poor: too clayey.
Boyd:					
BnC	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, area reclaim.
[1] BOD:					
Boyd part	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: slope	Poor: slope, too clayey, area reclaim.
Okaton part	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: slope, depth to rock.	Poor: too clayey, area reclaim, slope.
Bridgeport:					
Bp	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Fair: too clayey.
Bt	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Fair: too clayey.
Canning:					
CaB	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Fair: area reclaim.
[1] CbD:					
Canning part	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Fair: area reclaim.
Murdo part	Moderate: slope.	Severe: seepage, slope.	Severe: seepage	Severe: seepage	Poor: seepage, area reclaim.

TABLE 7.—*Sanitary facilities*—Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Carter: Cc	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
Cass: Cd	Moderate: floods.	Severe: seepage	Severe: seepage	Severe: seepage	Good.
Chappell: ChA	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Poor: area reclaim.
[1] CnC: Chappell part	Slight	Severe: seepage, slope.	Severe: seepage	Severe: seepage	Fair: thin layer, area reclaim.
Dix part	Slight	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage	Poor: small stones, too sandy, area reclaim.
Dix: DaA	Slight	Severe: seepage	Severe: seepage, too sandy.	Severe: seepage	Poor: small stones, too sandy, area reclaim.
[1] DbD	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage	Poor: small stones, too sandy, area reclaim.
Doger: DgB	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Fair: too sandy.
[1] DmA: Doger part	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Fair: too sandy.
Elsmere part	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: too sandy.
Dunday: DnC2	Slight	Severe: seepage	Severe: seepage, too sandy.	Severe: seepage	Fair: too sandy.
[1] DuC: Dunday part	Slight	Severe: seepage	Severe: seepage, too sandy.	Severe: seepage	Fair: too sandy.
Doger part	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Fair: too sandy.
Elsmere: Em	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: too sandy.
Epping: EpE	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Poor: area reclaim, slope.
Erd: Er	Severe: percs slowly, wetness.	Slight	Severe: too clayey, wetness.	Moderate: floods, wetness.	Poor: too clayey.
[1] Es: Erd part	Severe: percs slowly, wetness.	Slight	Severe: too clayey, wetness.	Moderate: floods, wetness.	Poor: too clayey.
Hurley part	Severe: percs slowly, depth to rock.	Slight	Severe: too clayey, depth to rock.	Slight	Poor: too clayey, area reclaim.
Haverson: Ha	Severe: floods	Moderate: seepage.	Severe: floods	Severe: floods	Good.

TABLE 7.—*Sanitary facilities*—Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Holt:					
[1] HbA:					
Holt part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: seepage	Poor: area reclaim.
Anselmo part	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Good.
Huggins:					
HgA	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
[1] HkB:					
Huggins part	Severe: percs slowly, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
Kadoka part	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
Hurley:					
Hr	Severe: percs slowly, depth to rock.	Slight	Severe: too clayey, depth to rock.	Slight	Poor: too clayey, area reclaim.
Inavale:					
Ia, [1] Ic	Severe: floods	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: too sandy.
Kadoka:					
KaA	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
[1] KbD:					
Kadoka part	Severe: depth to rock.	Severe: slope	Severe: depth to rock.	Moderate: slope, depth to rock.	Poor: area reclaim.
Epping part	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Keya:					
Ke	Severe: floods	Moderate: seepage.	Severe: floods	Severe: floods	Good.
Kolls:					
Ko	Severe: percs slowly, floods.	Slight	Severe: floods, too clayey, wetness.	Severe: floods, wetness.	Poor: too clayey, hard to pack.
Lakoma:					
[1] LkC:					
Lakoma part	Severe: depth to rock, percs slowly.	Severe: slope	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, area reclaim.
Millboro part	Severe: percs slowly.	Severe: slope	Severe: too clayey.	Slight	Poor: too clayey.
[1] LoD:					
Lakoma part	Severe: depth to rock, percs slowly.	Severe: slope	Severe: depth to rock, too clayey.	Moderate: slope, depth to rock.	Poor: too clayey, area reclaim.
Okaton part	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: too clayey, area reclaim.
Lowry:					
LwA	Slight	Moderate: seepage.	Slight	Slight	Good.
Manter:					
MaA, MaB	Slight	Severe: seepage	Severe: seepage	Severe: seepage	Good.

TABLE 7.—*Sanitary facilities*—Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
[1] MfE:					
Manter part	Severe: slope	Severe: slope, seepage.	Severe: seepage	Severe: seepage, slope.	Poor: slope.
Anselmo part	Severe: slope	Severe: seepage, slope.	Severe: seepage	Severe: seepage, slope.	Poor: slope.
Marsh: Mh.					
Millboro:					
MoA	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
MoB	Severe: percs slowly.	Moderate: slope	Severe: too clayey.	Slight	Poor: too clayey.
MoC	Severe: percs slowly.	Severe: slope	Severe: too clayey.	Slight	Poor: too clayey.
Mosher:					
Mr	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: hard to pack, too clayey.
[1] Ms:					
Mosher part	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: hard to pack, too clayey.
Jerauld part	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Munjor:					
Mu	Severe: floods	Severe: seepage	Severe: seepage, floods.	Severe: floods	Good.
Okaton:					
[1] OAF	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey, slope.	Severe: slope, depth to rock.	Poor: too clayey, area reclaim, slope.
[1] OBE:					
Okaton part	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey, slope.	Severe: slope, depth to rock.	Poor: too clayey, area reclaim, slope.
Lakoma part	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: slope	Poor: slope, too clayey, area reclaim.
[1] OcF:					
Okaton part	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey, slope.	Severe: slope, depth to rock.	Poor: too clayey, area reclaim, slope.
Rock outcrop part.					
Onita:					
On	Severe: percs slowly, floods.	Slight	Severe: floods	Severe: floods	Fair: too clayey, wetness.
[1] Oo:					
Onita part	Severe: percs slowly, floods.	Slight	Severe: floods	Severe: floods	Fair: too clayey, wetness.
Mosher part	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: hard to pack, too clayey.
Opal:					
OpC	Severe: percs slowly, depth to rock.	Moderate: depth to rock, slope.	Severe: too clayey, depth to rock.	Moderate: depth to rock.	Poor: too clayey, area reclaim.

TABLE 7.—*Sanitary facilities*—Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
[1] OsE:					
Opal part	Severe: slope, percs slowly, depth to rock.	Severe: slope	Severe: too clayey, depth to rock.	Severe: slope	Poor: slope, too clayey, area reclaim.
Sansarc part	Severe: slope, percs slowly, depth to rock.	Severe: slope, depth to rock.	Severe: too clayey, depth to rock.	Severe: slope, depth to rock.	Poor: slope, too clayey, area reclaim.
Orwet:					
Ow	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness, too sandy.
Promise:					
PrA	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
PrB	Severe: percs slowly.	Moderate: slope	Severe: too clayey.	Slight	Poor: too clayey.
PrC	Severe: percs slowly.	Severe: slope	Severe: too clayey.	Slight	Poor: too clayey.
PsA	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: floods.	Poor: too clayey.
PtA	Moderate: percs slowly.	Slight	Severe: too clayey.	Moderate: floods.	Poor: too clayey.
Ree:					
ReA	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
ReB	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
ReC	Moderate: percs slowly.	Severe: slope	Moderate: too clayey.	Slight	Fair: too clayey.
ReD	Moderate: percs slowly, slope.	Severe: slope	Moderate: too clayey.	Moderate: slope.	Fair: too clayey, slope.
Reliance:					
ReA	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
ReB	Severe: percs slowly.	Moderate: slope	Moderate: too clayey.	Slight	Fair: too clayey.
ReC, ReC2	Severe: percs slowly.	Severe: slope	Moderate: too clayey.	Slight	Fair: too clayey.
Ronson:					
RfA	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage	Poor: area reclaim.
[1] RoB:					
Ronson part	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage	Poor: area reclaim.
Tassel part	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: area reclaim.
Rosebud:					
RsB	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
[1] RuC:					
Rosebud part	Severe: depth to rock.	Severe: slope	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
Canyon part	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.

TABLE 7.—*Sanitary facilities*—Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
[1] RuD:					
Rosebud part	Severe: depth to rock.	Severe: slope	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
Canyon part	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Sansarc:					
[1] SAE:					
Sansarc part	Severe: slope, percs slowly, depth to rock.	Severe: slope, depth to rock.	Severe: slope, too clayey, depth to rock.	Severe: slope	Poor: slope, too clayey, area reclaim.
Opal part	Severe: slope, percs slowly, depth to rock.	Severe: slope	Severe: too clayey, depth to rock.	Severe: slope	Poor: slope, too clayey, area reclaim.
[1] ScF:					
Sansarc part	Severe: slope, percs slowly, depth to rock.	Severe: slope, depth to rock.	Severe: slope, too clayey, depth to rock.	Severe: slope	Poor: slope, too clayey, area reclaim.
Shale outcrop part.					
Schamber:					
[1] ShE:					
Schamber part	Severe: slope	Severe: slope, seepage.	Severe: slope, seepage, too sandy.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
Murdo part	Severe: slope	Severe: seepage, slope.	Severe: seepage	Severe: seepage, slope.	Poor: seepage, area reclaim, slope.
Scott:					
So	Severe: floods, percs slowly, wetness.	Slight	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Shena:					
SsB	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim.
Swanboy:					
Sw	Severe: percs slowly.	Moderate: slope	Severe: too clayey.	Slight	Poor: too clayey.
Tassel:					
TaE	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: seepage, slope.	Poor: slope, area reclaim.
[1] TrF:					
Tassel part	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: seepage, slope.	Poor: slope, area reclaim.
Rock outcrop part.					
Valentine:					
VaD	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage	Poor: too sandy, area reclaim.
[1] VdC:					
Valentine part	Slight	Severe: seepage	Severe: seepage, too sandy.	Severe: seepage	Poor: too sandy, area reclaim.
Dunday part	Slight	Severe: seepage	Severe: seepage, too sandy.	Severe: seepage	Fair: too sandy.

TABLE 7.—*Sanitary facilities*—Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
[1] VnD:					
Valentine part	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage	Poor: too sandy, area reclaim.
Tassel part	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: seepage, depth to rock.	Poor: area reclaim.
Vetal:					
Vt	Severe: floods	Severe: seepage	Severe: seepage, floods.	Severe: seepage, floods.	Good.
Wanblee:					
[1] Wa:					
Wanblee part	Severe: percs slowly, depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
Wortman part	Severe: percs slowly, depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Poor: too clayey, area reclaim.
Wann:					
Wb	Severe: wetness, floods.	Severe: seepage, wetness.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Good.
Westover:					
WeE	Severe: slope	Severe: slope, seepage.	Severe: seepage	Severe: slope, seepage.	Poor: slope.
Wewela:					
WfA, WgA, WgB	Severe: depth to rock, percs slowly.	Moderate: depth to rock.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: area reclaim, too clayey.
Whitelake:					
Wh	Severe: wetness.	Moderate: seepage.	Severe: seepage	Severe: seepage	Fair: too sandy.
[1] Wk:					
Whitelake part	Severe: wetness.	Moderate: seepage.	Severe: seepage	Severe: seepage	Fair: too sandy.
Lute part	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, seepage.	Poor: wetness.
Witten:					
Wn	Severe: percs slowly, wetness.	Slight	Severe: too clayey, floods.	Severe: floods	Poor: too clayey.
Wortman:					
Wo	Severe: percs slowly, depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Poor: too clayey, area reclaim.

[1] This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

problems in excavating and filling the trenches. Also, seepage into the refuse increases the risk of pollution of ground water. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability that can cause noxious liquids to contaminate local ground water.

Unless otherwise stated, the ratings in table 7 apply only to soil properties and features within a depth of about 6 feet. If the trench is deeper, ratings of slight or moderate may not be valid. Site investigation is needed before a site is selected.

In the area-type sanitary landfill, refuse is placed on the surface of the soil in successive layers. The limitations caused by soil texture, depth to bedrock, and stone content do not apply to this type of landfill. Soil wetness, however, may be a limitation because of difficulty in operating equipment.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill during both wet and dry weather. Soils that are loamy or silty and free of stones or boulders are more suitable than other soils. Clayey soils may be sticky and

TABLE 8.—*Construction materials*

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," and "unsuited." Absence of an entry means soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Anselmo:				
AaB2	Fair: low strength	Poor: excess fines	Unsuited	Poor: too sandy.
AbB, AbC	Fair: low strength	Poor: excess fines	Unsuited	Good.
AbD	Fair: low strength	Poor: excess fines	Unsuited	Fair: slope.
[1] AhC:				
Anselmo part	Fair: low strength	Poor: excess fines	Unsuited	Good.
Holt part	Fair: low strength, area reclaim, thin layer.	Poor: excess fines	Unsuited	Fair: thin layer.
[1] AtD:				
Anselmo part	Fair: slope, low strength.	Poor: excess fines	Unsuited	Poor: slope.
Tassel part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: area reclaim, slope.
[1] AvA:				
Anselmo part	Fair: low strength	Poor: excess fines	Unsuited	Good.
Vetal part	Fair: low strength	Poor: excess fines	Unsuited	Good.
Bankard:				
[1] Ba	Fair: low strength	Fair: excess fines	Unsuited	Poor: too sandy.
Boro:				
[1] BmC:				
Boro part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
Millboro part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
Boyd:				
BnC	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
[1] BOD:				
Boyd part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope, too clayey.
Okaton part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey, slope.
Bridgeport:				
Bp, Bt	Fair: low strength	Unsuited	Unsuited	Fair: too clayey.
Canning:				
CaB	Good	Fair: excess fines	Fair: excess fines	Fair: thin layer.
[1] CbD:				
Canning part	Good	Fair: excess fines	Fair: excess fines	Fair: thin layer.
Murdo part	Good	Fair: excess fines	Fair: excess fines	Poor: thin layer, area reclaim.
Carter:				
Cc	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Fair: thin layer.
Cass:				
Cd	Fair: low strength	Poor: excess fines	Unsuited	Good.
Chappell:				
ChA	Good	Good	Good	Fair: area reclaim.

TABLE 8.—*Construction materials*—Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
[1] CnC:				
Chappell part	Good	Good	Good	Fair: area reclaim.
Dix part	Good	Good	Good	Poor: small stones, area reclaim.
Dix:				
DaA, [1] DbD	Good	Good	Good	Poor: small stones, area reclaim.
Doger:				
DgB	Good	Poor: excess fines	Unsuited	Fair: too sandy.
[1] DmA:				
Doger part	Good	Poor: excess fines	Unsuited	Fair: too sandy.
Elsmere part	Fair: wetness	Fair: excess fines	Unsuited	Good.
Dunday:				
DnC2	Good	Fair: excess fines	Unsuited	Fair: too sandy.
[1] DuC:				
Dunday part	Good	Fair: excess fines	Unsuited	Fair: too sandy.
Doger part	Good	Poor: excess fines	Unsuited	Fair: too sandy.
Elsmere:				
Em	Fair: wetness	Fair: excess fines	Unsuited	Good.
Epping:				
EpE	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: thin layer, area reclaim, slope.
Erd:				
Er	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
[1] Es:				
Erd part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
Hurley part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: thin layer.
Haverson:				
Ha	Fair: low strength	Unsuited	Unsuited	Good.
Holt:				
[1] HbA:				
Holt part	Fair: low strength, thin layer, area reclaim.	Poor: excess fines	Unsuited	Fair: thin layer.
Anselmo part	Fair: low strength	Poor: excess fines	Unsuited	Good.
Huggins:				
HgA	Poor: shrink-swell, low strength, area reclaim.	Unsuited	Unsuited	Poor: thin layer.
[1] HkB:				
Huggins part	Poor: shrink-swell, low strength, area reclaim.	Unsuited	Unsuited	Poor: thin layer.
Kadoka part	Poor: low strength, area reclaim.	Unsuited	Unsuited	Fair: too clayey, area reclaim.
Hurley:				
Hr	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: thin layer.

TABLE 8.—*Construction materials*—Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Inavale:				
Ia, [1] Ic	Good	Fair: excess fines	Unsuited	Poor: too sandy, area reclaim.
Kadoka:				
KaA	Poor: low strength, area reclaim.	Unsuited	Unsuited	Fair: too clayey, area reclaim.
[1] KbD:				
Kadoka part	Poor: low strength, area reclaim.	Unsuited	Unsuited	Fair: slope, too clayey, area reclaim.
Epping part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: thin layer, area reclaim.
Keya:				
Ke	Fair: low strength, shrink-swell.	Unsuited	Unsuited	Good.
Kolls:				
Ko	Poor: shrink-swell, low strength, floods.	Unsuited	Unsuited	Poor: too clayey, wetness.
Lakoma:				
[1] LkC:				
Lakoma part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
Millboro part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
[1] LoD:				
Lakoma part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
Okaton part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
Lowry:				
LwA	Fair: frost action, low strength.	Unsuited	Unsuited	Good.
Manter:				
MaA, MaB	Fair: low strength, frost action.	Poor: excess fines	Unsuited	Good.
[1] MfE:				
Manter part	Fair: low strength, frost action, slope.	Poor: excess fines	Unsuited	Fair: slope.
Anselmo part	Fair: low strength, slope.	Poor: excess fines	Unsuited	Poor: slope.
Marsh:				
Mh.				
Millboro:				
MoA, MoB, MoC	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
Mosher:				
Mr	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: thin layer.
[1] Ms:				
Mosher part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: thin layer.
Jerauld part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: thin layer, too clayey, excess sodium.

TABLE 8.—*Construction materials*—Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Munjor: Mu	Fair: low strength	Poor: excess fines	Unsuited	Good.
Okaton: [1] OAF	Poor: shrink-swell, low strength, slope.	Unsuited	Unsuited	Poor: too clayey, slope.
[1] OBE: Okaton part	Poor: shrink-swell, low strength, slope.	Unsuited	Unsuited	Poor: too clayey, slope.
Lakoma part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope, too clayey.
[1] OcF: Okaton part	Poor: shrink-swell, low strength, slope.	Unsuited	Unsuited	Poor: too clayey, slope.
Rock outcrop part.				
Onita: On	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Fair: thin layer.
[1] Oo: Onita part	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Fair: thin layer.
Mosher part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: thin layer.
Opal: OpC	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
[1] OsE: Opal part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope, too clayey.
Sansarc part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope, too clayey, area reclaim.
Orwet: Ow	Poor: wetness	Poor: excess fines	Unsuited	Poor: wetness.
Promise: PrA, PrB, PrC, PsA, PtA	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
Ree: ReA, ReB, ReC	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Fair: too clayey.
ReD	Fair: low strength, shrink-swell.	Unsuited	Unsuited	Fair: slope, too clayey.
Reliance: ReA, ReB, ReC, ReC2	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Fair: thin layer, too clayey.
Ronson: RfA	Poor: thin layer, area reclaim.	Poor: excess fines	Unsuited	Fair: area reclaim, thin layer.
[1] RoB: Ronson part	Poor: thin layer, area reclaim.	Poor: excess fines	Unsuited	Fair: area reclaim, thin layer.
Tassel part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: area reclaim.

TABLE 8.—*Construction materials*—Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Rosebud:				
RsB	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Fair: area reclaim.
[1] RuC:				
Rosebud part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Fair: area reclaim.
Canyon part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: area reclaim.
[1] RuD:				
Rosebud part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Fair: area reclaim, slope.
Canyon part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: area reclaim.
Sansarc:				
[1] SAE:				
Sansarc part	Poor: slope, shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope, too clayey, area reclaim.
Opal part	Poor: slope, shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope, too clayey.
[1] ScF:				
Sansarc part	Poor: slope, shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope, too clayey, area reclaim.
Shale outcrop part.				
Schamber:				
[1] ShE:				
Schamber part	Poor: slope	Good	Good	Poor: slope, thin layer, area reclaim.
Murdo part	Fair: slope	Fair: excess fines	Fair: excess fines	Poor: thin layer, area reclaim, slope.
Scott:				
So	Poor: shrink-swell, wetness.	Unsuited	Unsuited	Poor: wetness, thin layer.
Shena:				
SsB	Poor: shrink-swell, low strength, area reclaim.	Unsuited	Unsuited	Poor: thin layer, area reclaim.
Swanboy:				
Sw	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
Tassel:				
TaE	Poor: thin layer, slope, area reclaim.	Unsuited	Unsuited	Poor: area reclaim, slope.
[1] TrF:				
Tassel part	Poor: thin layer, slope, area reclaim.	Unsuited	Unsuited	Poor: area reclaim, slope.
Rock outcrop part.				
Valentine:				
VaD	Good	Good	Unsuited	Poor: too sandy, slope.
[1] VdC:				
Valentine part	Good	Good	Unsuited	Fair: too sandy.
Dunday part	Good	Fair: excess fines	Unsuited	Fair: too sandy.

TABLE 8.—*Construction materials*—Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
[1] VnD: Valentine part	Good	Good	Unsuited	Fair: too sandy, slope.
Tassel part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: area reclaim.
Vetal: Vt	Fair: low strength	Poor: excess fines	Unsuited	Good.
Wanblee: [1] Wa: Wanblee part	Poor: shrink-swell, low strength, area reclaim.	Unsuited	Unsuited	Poor: thin layer, too clayey, excess salt.
Wortman part	Poor: low strength	Unsuited	Unsuited	Poor: thin layer.
Wann: Wb	Fair: low strength, wetness.	Poor: excess fines	Unsuited	Good.
Westover: WeE	Fair: slope, area reclaim.	Fair: excess fines	Fair: excess fines	Poor: slope.
Wewela: WfA	Poor: shrink-swell, low strength, area reclaim.	Unsuited	Unsuited	Fair: too sandy, area reclaim.
WgA, WgB	Poor: shrink-swell, low strength, area reclaim.	Unsuited	Unsuited	Fair: thin layer, area reclaim.
Whitelake: Wh	Fair: low strength, wetness.	Poor: excess fines	Unsuited	Fair: thin layer.
[1] Wk: Whitelake part	Fair: low strength, wetness.	Poor: excess fines	Unsuited	Fair: thin layer.
Lute part	Fair: low strength, wetness.	Poor: excess fines	Unsuited	Poor: excess sodium, excess salt, thin layer.
Witten: Wn	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
Wortman: Wo	Poor: low strength, area reclaim.	Unsuited	Unsuited	Poor: thin layer, excess salts.

[1] This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

difficult to spread; sandy soils may be subject to soil blowing.

In addition to these features, the soils selected for final cover of landfills should be suitable for growing plants. In comparison with other horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other important factors are those that affect reclamation of the borrow areas, such as slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill,

TABLE 9.—*Water management*

["Seepage" and some of the other terms that describe restrictive soil features are defined in the Glossary. Absence of an entry means soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Irrigation	Terraces and diversions	Grassed waterways
Anselmo:						
AaB2, AbB	Seepage	Seepage, piping.	No water	Soil blowing	Soil blowing	Favorable.
AbC, AbD	Seepage	Seepage, piping.	No water	Soil blowing, slope.	Soil blowing	Favorable.
[1] AhC:						
Anselmo part	Seepage	Seepage, piping.	No water	Soil blowing, slope.	Soil blowing	Favorable.
Holt part	Seepage, depth to rock, slope.	Piping, thin layer.	No water	Slope, soil blowing, rooting depth.	Depth to rock, soil blowing.	Droughty, depth to rock.
[1] AtD:						
Anselmo part	Seepage	Seepage, piping.	No water	Soil blowing, slope.	Slope, soil blowing.	Slope.
Tassel part	Depth to rock, slope, seepage.	Thin layer, seepage, piping.	No water	Droughty, rooting depth, slope.	Depth to rock, slope, soil blowing.	Rooting depth, droughty.
[1] AvA:						
Anselmo part	Seepage	Seepage, piping.	No water	Soil blowing	Soil blowing	Favorable.
Vetal part	Seepage	Piping	No water	Soil blowing, floods.	Soil blowing, floods.	Favorable.
Bankard:						
[1] Ba	Seepage	Piping, seepage.	Deep to water	Floods, droughty.	Not needed	Droughty.
Boro:						
[1] BmC:						
Boro part	Slope	Hard to pack	No water	Percs slowly, slow intake, slope.	Percs slowly	Erodes easily, percs slowly.
Millboro part	Slope	Hard to pack	No water	Slope, slow intake, percs slowly.	Percs slowly	Percs slowly, erodes easily.
Boyd:						
BnC	Slope, depth to rock.	Hard to pack, thin layer.	No water	Slope, slow intake, percs slowly.	Depth to rock, percs slowly.	Percs slowly, depth to rock, erodes easily.
[1] BOD:						
Boyd part	Slope, depth to rock.	Hard to pack, thin layer.	No water	Slope, slow intake, percs slowly.	Slope, depth to rock, percs slowly.	Slope, depth to rock, erodes easily.
Okaton part	Slope, depth to rock.	Hard to pack	No water	Slow intake, slope, rooting depth.	Slope, depth to rock, percs slowly.	Slope, rooting depth, erodes easily.
Bridgeport:						
Bp	Seepage	Favorable	No water	Favorable	Favorable	Favorable.
Bt	Seepage	Favorable	No water	Floods	Floods	Favorable.
Canning:						
CaB	Seepage	Seepage	No water	Favorable	Favorable	Favorable.
[1] CbD:						
Canning part	Seepage	Seepage	No water	Slope	Favorable	Favorable.
Murdo part	Seepage	Seepage, thin layer.	No water	Droughty, slope.	Too sandy	Droughty, rooting depth, slope.

TABLE 9.—*Water management*—Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Irrigation	Terraces and diversions	Grassed waterways
Carter: Cc	Favorable	Hard to pack	No water	Slow intake, percs slowly.	Not needed	Percs slowly.
Cass: Cd	Seepage	Seepage	No water	Floods, soil blowing.	Not needed	Favorable.
Chappell: ChA	Seepage	Seepage	No water	Fast intake, droughty.	Not needed	Droughty.
[1] CnC: Chappell part	Seepage	Seepage	No water	Fast intake, slope, droughty.	Soil blowing, too sandy.	Droughty.
Dix part	Seepage	Seepage	No water	Droughty, slope.	Too sandy, rooting depth.	Droughty, rooting depth.
Dix: DaA, [1] DbD	Seepage	Seepage	No water	Fast intake, droughty.	Too sandy, rooting depth.	Droughty, rooting depth.
Doger: DgB	Seepage	Piping, seepage.	No water	Fast intake, soil blowing.	Too sandy, soil blowing.	Favorable.
[1] DmA: Doger part	Seepage	Piping, seepage.	No water	Fast intake, soil blowing.	Too sandy, soil blowing.	Favorable.
Elsmere part	Seepage	Seepage, piping.	Favorable	Fast intake, wetness.	Not needed	Favorable.
Dunday: DnC2	Seepage	Seepage, unstable fill, piping.	No water	Fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
[1] DuC: Dunday part	Seepage	Seepage, unstable fill, piping.	No water	Fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Doger part	Seepage	Piping, seepage.	No water	Fast intake, soil blowing.	Too sandy, soil blowing.	Favorable.
Elsmere: Em	Seepage	Seepage, piping.	Favorable	Fast intake, seepage, wetness.	Not needed	Favorable.
Epping: EpE	Depth to rock, slope.	Thin layer	No water	Rooting depth, slope.	Depth to rock	Rooting depth, depth to rock, slope.
Erd: Er	Favorable	Hard to pack	Deep to water	Slow intake, wetness, percs slowly.	Not needed	Percs slowly, erodes easily.
[1] Es: Erd part	Favorable	Hard to pack	Deep to water	Slow intake, wetness, percs slowly.	Not needed	Percs slowly, erodes easily.
Hurley part	Depth to rock	Hard to pack, piping.	No water	Slow intake, percs slowly, excess sodium.	Not needed	Excess sodium, percs slowly.

TABLE 9.—*Water management*—Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Irrigation	Terraces and diversions	Grassed waterways
Haverson:						
Ha	Seepage	Piping	Deep to water	Floods	Not needed	Favorable.
Holt:						
[1] HbA:						
Holt part	Seepage, depth to rock.	Piping, thin layer.	No water	Soil blowing, rooting depth.	Not needed	Droughty, depth to rock.
Anselmo part	Seepage	Seepage, piping, erodes easily.	No water	Fast intake	Not needed	Erodes easily.
Huggins:						
HgA	Depth to rock	Thin layer, hard to pack.	No water	Rooting depth	Not needed	Depth to rock.
[1] HkB:						
Huggins part	Slope, depth to rock.	Thin layer, hard to pack.	No water	Slope, rooting depth.	Favorable	Slope, depth to rock.
Kadoka part	Slope, seepage, depth to rock.	Thin layer	No water	Slope	Depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Hurley:						
Hr	Depth to rock	Hard to pack, piping.	No water	Slow intake, percs slowly, excess sodium.	Not needed	Excess sodium, percs slowly.
Inavale:						
Ia, [1] Ic	Seepage	Seepage, piping.	No water	Fast intake, seepage.	Not needed	Not needed.
Kadoka:						
KaA	Seepage, depth to rock.	Thin layer	No water	Favorable	Not needed	Erodes easily, depth to rock.
[1] KbD:						
Kadoka part	Slope, seepage, depth to rock.	Thin layer	No water	Slope	Slope, depth to rock, erodes easily.	Slope. erodes easily, depth to rock.
Epping part	Depth to rock, slope.	Thin layer	No water	Rooting depth, slope.	Depth to rock	Rooting depth, depth to rock.
Keya:						
Ke	Seepage	Favorable	No water	Floods	Not needed	Favorable.
Kolls:						
Ko	Favorable	Hard to pack	No water	Slow intake, floods, wetness.	Not needed	Percs slowly.
Lakoma:						
[1] LkC:						
Lakoma part	Slope, depth to rock.	Hard to pack	No water	Slope, slow intake, rooting depth.	Depth to rock, percs slowly.	Slope, percs slowly, erodes easily.
Millboro part	Slope	Hard to pack	No water	Slope, slow intake, percs slowly.	Percs slowly	Percs slowly, erodes easily.
[1] LoD:						
Lakoma part	Slope, depth to rock.	Shrink-swell, low strength, compressible.	No water	Slope, slow intake, rooting depth.	Slope, depth to rock, percs slowly.	Slope, percs slowly, erodes easily.
Okaton part	Slope, depth to rock.	Hard to pack	No water	Slow intake, rooting depth, slope.	Slope, depth to rock, percs slowly.	Slope, rooting depth, erodes easily.

TABLE 9.—*Water management*—Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Irrigation	Terraces and diversions	Grassed waterways
Lowry: LwA	Seepage	Piping	No water	Favorable	Favorable	Favorable.
Manter: MaA	Seepage	Piping, seepage.	No water	Soil blowing	Soil blowing	Favorable.
MaB	Seepage	Piping, seepage.	No water	Soil blowing	Soil blowing	Favorable.
[1] MfE: Manter part	Seepage	Piping, seepage.	No water	Slope, soil blowing.	Soil blowing, slope.	Slope.
Anselmo part	Seepage	Seepage, piping,	No water	Soil blowing, slope.	Slope, soil blowing.	Slope.
Marsh: Mh.						
Millboro: MoA	Favorable	Hard to pack	No water	Slow intake, percs slowly.	Not needed	Percs slowly, erodes easily.
MoB	Favorable	Hard to pack	No water	Slow intake, percs slowly, erodes easily.	Percs slowly	Percs slowly, erodes easily.
MoC	Slope	Hard to pack	No water	Slope, slow intake, percs slowly.	Percs slowly	Percs slowly, erodes easily.
Mosher: Mr	Seepage	Hard to pack, piping.	Deep to water	Slow intake, percs slowly, excess sodium.	Not needed	Excess salt, excess sodium.
[1] Ms: Mosher part	Seepage	Hard to pack, piping.	Deep to water	Slow intake, percs slowly, excess sodium.	Not needed	Excess salt, excess sodium.
Jerauld part	Favorable	Hard to pack, piping.	No water	Slow intake, excess sodium.	Not needed	Excess sodium, percs slowly.
Munjor: Mu	Seepage	Piping, seepage.	No water	Floods, soil blowing.	Not needed	Favorable.
Okaton: [1] OAF	Slope, depth to rock.	Hard to pack	No water	Slope, rooting depth, slow intake.	Slope, depth to rock, percs slowly.	Slope, percs slowly, rooting depth.
[1] OBE: Okaton part	Slope, depth to rock.	Hard to pack	No water	Slope, rooting depth, slow intake.	Slope, depth to rock, percs slowly.	Slope, percs slowly, rooting depth.
Lakoma part	Slope, depth to rock.	Shrink-swell, low strength, compressible.	No water	Slope, slow intake, rooting depth.	Slope, depth to rock, percs slowly.	Slope, percs slowly, erodes easily.
[1] OcF: Okaton part	Slope, depth to rock.	Hard to pack	No water	Slope, rooting depth, slow intake.	Slope, depth to rock, percs slowly.	Slope, percs slowly, rooting depth.
Rock outcrop part.						
Onita: On	Favorable	Hard to pack	Deep to water	Wetness, floods.	Not needed	Favorable.

TABLE 9.—*Water management*—Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Irrigation	Terraces and diversions	Grassed waterways
[1] Oo: Onita part	Favorable	Hard to pack	Deep to water	Wetness, floods.	Not needed	Favorable.
Mosher part	Seepage	Hard to pack, piping.	Deep to water	Slow intake, percs slowly, excess sodium.	Not needed	Excess salt, excess sodium.
Opal: OpC	Slope, depth to rock.	Hard to pack	No water	Slope, slow intake, rooting depth.	Percs slowly	Percs slowly, erodes easily, depth to rock.
[1] OsE: Opal part	Slope, depth to rock.	Hard to pack	No water	Slope, slow intake, rooting depth.	Slope, percs slowly.	Slope, percs slowly, depth to rock.
Sansarc part	Slope, depth to rock.	Shrink-swell, low strength, compressible.	No water	Slope, slow intake, rooting depth.	Slope, depth to rock, percs slowly.	Slope, rooting depth, droughty.
Orwet: Ow	Seepage	Seepage, piping.	Favorable	Wetness, fast intake.	Not needed	Wetness.
Promise: PrA	Favorable	Hard to pack	No water	Slow intake, percs slowly.	Not needed	Percs slowly, erodes easily.
PrB	Slope	Hard to pack	No water	Slow intake, percs slowly, erodes easily.	Percs slowly	Erodes easily, percs slowly.
PrC	Slope	Hard to pack	No water	Slope, slow intake, percs slowly.	Percs slowly	Erodes easily, percs slowly.
PsA	Favorable	Hard to pack	No water	Floods	Not needed	Percs slowly, erodes easily.
PtA	Seepage	Hard to pack	No water	Slow intake, percs slowly.	Not needed	Percs slowly, erodes easily.
Ree: RaA	Seepage	Favorable	No water	Favorable	Not needed	Favorable.
RaB	Seepage	Favorable	No water	Favorable	Favorable	Favorable.
RaC	Slope, seepage	Favorable	No water	Slope	Favorable	Favorable.
RaD	Slope, seepage	Favorable	No water	Slope	Slope	Slope.
Reliance: ReA	Favorable	Favorable	No water	Favorable	Not needed	Favorable.
ReB	Favorable	Favorable	No water	Favorable	Favorable	Favorable.
ReC, ReC2	Slope	Favorable	No water	Slope	Favorable	Favorable.
Ronson: RfA	Seepage, depth to rock.	Piping, seepage.	No water	Rooting depth	Not needed	Depth to rock.
[1] RoB: Ronson part	Seepage, depth to rock.	Piping, seepage.	No water	Rooting depth	Depth to rock, soil blowing.	Depth to rock.
Tassel part	Depth to rock, seepage.	Thin layer, seepage, piping.	No water	Droughty, rooting depth.	Depth to rock, soil blowing.	Rooting depth, droughty.

TABLE 9.—*Water management*—Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Irrigation	Terraces and diversions	Grassed waterways
Rosebud:						
RsB	Depth to rock, slope.	Thin layer, piping.	No water	Rooting depth	Favorable	Depth to rock.
[1] RuC:						
Rosebud part	Depth to rock, slope.	Thin layer, piping.	No water	Rooting depth, slope.	Favorable	Depth to rock.
Canyon part	Depth to rock, slope.	Thin layer	No water	Rooting depth, slope.	Depth to rock, slope.	Slope, depth to rock.
[1] RuD:						
Rosebud part	Depth to rock, slope.	Thin layer, piping.	No water	Rooting depth, slope.	Slope	Slope, depth to rock.
Canyon part	Depth to rock, slope.	Thin layer	No water	Rooting depth, slope.	Depth to rock, slope.	Slope, depth to rock.
Sansarc:						
[1] SAE:						
Sansarc part	Slope, depth to rock.	Shrink-swell, low strength, compressible.	No water	Slope, slow intake, rooting depth.	Slope, depth to rock, percs slowly.	Slope, rooting depth, droughty.
Opal part	Slope, depth to rock.	Hard to pack	No water	Slope, slow intake, rooting depth.	Slope, percs slowly.	Slope, percs slowly, depth to rock.
[1] ScF:						
Sansarc part	Slope, depth to rock.	Shrink-swell, low strength, compressible.	No water	Slope, slow intake, rooting depth.	Slope, depth to rock, percs slowly.	Slope, rooting depth, droughty.
Shale outcrop part.						
Schamber:						
[1] ShE:						
Schamber part	Slope, seepage	Seepage	No water	Fast intake, droughty, slope.	Slope, too sandy.	Slope, droughty.
Murdo part	Slope, seepage	Seepage, thin layer.	No water	Droughty, slope.	Too sandy, slope.	Droughty, slope, rooting depth.
Scott:						
So	Favorable	Hard to pack	Slow refill	Floods, wetness, percs slowly.	Not needed	Wetness, percs slowly.
Shena:						
SsB	Slope, depth to rock.	Hard to pack, thin layer.	No water	Percs slowly, rooting depth.	Depth to rock, percs slowly.	Slope, percs slowly, rooting depth.
Swanboy:						
Sw	Favorable	Hard to pack	No water	Slow intake, excess salt.	Percs slowly	Percs slowly, excess salt, erodes easily.
Tassel:						
TaE	Depth to rock, slope, seepage.	Seepage, thin layer, piping.	No water	Droughty, rooting depth, slope.	Depth to rock, slope, soil blowing.	Rooting depth, slope, droughty.
[1] TrF:						
Tassel part	Depth to rock, slope, seepage.	Seepage, thin layer, piping.	No water	Droughty, rooting depth, slope.	Depth to rock, slope, soil blowing.	Rooting depth, slope, droughty.
Rock outcrop part.						

TABLE 9.—*Water management*—Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Irrigation	Terraces and diversions	Grassed waterways
Valentine: VaD	Seepage	Seepage, piping.	No water	Fast intake, soil blowing, droughty.	Soil blowing, too sandy.	Erodes easily, droughty.
[1] VdC: Valentine part	Seepage	Seepage, piping, unstable fill.	No water	Fast intake, soil blowing, droughty.	Soil blowing, too sandy.	Erodes easily, droughty.
Dunday part	Seepage	Seepage, unstable fill, piping.	No water	Fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
[1] VnD: Valentine part	Seepage	Seepage, piping, unstable fill.	No water	Fast intake, droughty, soil blowing.	Erodes easily, piping, soil blowing.	Erodes easily, droughty.
Tassel part	Depth to rock, slope, seepage.	Thin layer, seepage, piping.	No water	Droughty, slope, rooting depth.	Depth to rock, erodes easily.	Rooting depth, droughty, slope.
Vetal: Vt	Seepage	Piping	No water	Floods, soil blowing.	Not needed	Favorable.
Wanblee: [1] Wa: Wanblee part	Favorable	Hard to pack, piping.	No water	Percs slowly, excess salt, excess sodium.	Not needed	Percs slowly, excess salt, excess sodium.
Wortman part	Depth to rock	Thin layer, hard to pack, piping.	No water	Percs slowly excess salt, excess sodium.	Not needed	Depth to rock, excess salt, excess sodium.
Wann: Wb	Seepage	Piping	Favorable	Floods, soil blowing.	Not needed	Favorable.
Westover: WeE	Seepage, slope	Piping, seepage.	No water	Slope	Not needed	Slope, droughty.
Wewela: WfA, WgA	Depth to rock	Thin layer, hard to pack.	No water	Rooting depth, soil blowing.	Not needed	Percs slowly, depth to rock.
WgB	Depth to rock	Thin layer, hard to pack.	No water	Rooting depth, soil blowing.	Percs slowly, complex slope, rooting depth.	Percs slowly, depth to rock.
Whitelake: Wh	Seepage	Piping, seepage.	Deep to water	Excess sodium, soil blowing, percs slowly.	Not needed	Excess salt, excess sodium, percs slowly.
[1] Wk: Whitelake part	Seepage	Piping, seepage.	Deep to water	Excess sodium, soil blowing, percs slowly.	Not needed	Excess salt, excess sodium, percs slowly.
Lute part	Seepage	Piping, seepage.	Favorable	Excess salt, wetness, excess sodium.	Not needed	Excess salt, excess sodium.
Witten: Wn	Favorable	Hard to pack	No water	Slow intake, percs slowly.	Not needed	Percs slowly, erodes easily.
Wortman: Wo	Favorable	Thin layer, hard to pack, piping.	No water	Percs slowly, excess salt, excess sodium.	Not needed	Depth to rock, excess salt, excess sodium.

[1] This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

sand, gravel, and topsoil is indicated in table 8 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet, and described as the survey is made.

Roadfill is soil material used in embankments for roads. The ratings reflect the ease of excavating and working the material and the expected performance of the material after it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about soil properties that determine such performance is given in the descriptions of soil series.

The ratings apply to the soil profile between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within the profile. The estimated engineering properties in table 10 provide more specific information about the nature of each horizon that can help determine its suitability for roadfill.

Soils rated *good* for roadfill have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have limiting features, such as high shrink-swell potential, high potential frost action, steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor,* regardless of the quality of the suitable material.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 8 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 10.

Topsoil is used where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material when preparing a seedbed and by the ability of the soil material to sustain plant growth. Also considered is the damage that would result to the area from which the topsoil is taken.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones, are low in content of gravel and other coarse fragments, and are gently sloping. They are low in soluble salts, which can limit plant growth, they are naturally fertile or respond well to fertilization, and they are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils; very firm clayey soils; soils that have suitable layers less than 8 inches thick; soils that have large amounts of gravel, stones, or soluble salts; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is much preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter. Consequently, careful preservation and use of material from these horizons are desirable.

Water management

Many soil properties and site features that affect water management have been identified in this soil survey. In table 9 soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or an embankment. Soils suitable for this use have low seepage potential, which is determined by the permeability and depth over fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

An aquifer-fed excavated pond is a body of water created by excavating a pit or dugout into a groundwater aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 9 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth of a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

Irrigation is affected by such properties as slope, susceptibility to flooding, hazards of water erosion and soil blowing, texture, salinity and alkalinity, depth of root zone, rate of water intake at the surface, permeability of the soil below the surface layer, available water capacity, need for drainage, and depth to the water table.

Terraces and diversions are embankments, or a combination of channels and ridges, constructed across a slope to intercept runoff and to allow the water to soak into the soil or flow slowly into an outlet. Properties that affect suitability of a soil for terraces are uniformity of slope and steepness; depth to bedrock or other unfavorable material; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff at nonerosive velocities to outlets. Properties that

affect the use of soil for waterways are slope, permeability, erodibility, and suitability for permanent vegetation.

Soil properties

Extensive data about soil properties collected during the soil survey are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of samples selected from representative profiles in the field.

When soil borings are made during field mapping, the soil scientist identified several important soil properties, such as the seasonal soil moisture condition or the presence of free water and its depth in the profile. For each horizon, the scientist notes the thickness of the soil and its color; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or natural pattern of cracks and pores in the undisturbed soil; and the consistence of soil in-place under the existing soil moisture conditions. The root depth of existing plants is recorded, soil reaction is determined, and any free carbonates are identified.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to characterize key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many of the series are available from nearby areas.

Based on summaries of available field and laboratory data, and listed in tables in this section, are estimated ranges in engineering properties and classifications and in physical and chemical properties for each major horizon of each soil in the survey area. Also, pertinent soil and water features and engineering test data are presented.

Engineering properties

Table 10 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area. These estimates are presented as ranges in values most likely to exist in areas where the soil is mapped.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Information is presented for each of these contrasting horizons. Depth to the upper and lower boundaries of each horizon in a typical profile of each soil is indicated. More information about the range in depth and in properties of each horizon is given for each soil series in "Descriptions of the soils."

Texture is described in table 10 in standard terms used by the United States Department of Agriculture (USDA). These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms used by USDA are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified soil classification system and the American Association of State Highway and Transportation Officials soil classification system (AASHTO). In table 10 soils in the survey area are classified according to both systems.

The Unified system (*2*) 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, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes: eight classes of coarse grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six of fine grained soils, identified as ML, CL, OL, MH, CH, and OH; and one of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL–ML.

The AASHTO system (*1*) classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is placed in one of seven basic groups ranging 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. At the other extreme, in group A–7, are fine grained soils. Highly organic soils are classified as A–8 on the basis of visual inspection.

When laboratory data are available, the A–1, A–2, and A–7 groups are further classified as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or more for the poorest. The AASHTO classification for soils tested in the survey area, with group index numbers in parentheses, is given in table 11. The estimated classification, without group index numbers, is given in table 10.

Also in table 10 the percentage, by weight, of cobbles or the rock fragments more than 3 inches in diameter are estimated for each major horizon. These estimates are determined largely by observing volume percentage in the field and then converting it, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four standard sieves is estimated for each major horizon. The estimates are based on tests of soils that were samples in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and plasticity index indicate the effect of water on the strength and consistency of soil. These indexes are used in both the Unified and the AASHTO soil classification systems. They also are used as indicators in making general predictions of soil behavior.

Range in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

TABLE 10.—*Engineering properties*

[The symbol < means less than; > means greater than.

Soil name and map symbol	Depth	USDA texture	Classification	
			Unified	AASHTO
	In			
Anselmo:				
AaB2	0–10	Loamy fine sand	SM, SM–SC	A–2
	10–44	Fine sandy loam	SM, SC	A–4, A–2
	44–60	Loamy fine sand	SM, SM–SC	A–2
AbB, AbC, AbD	0–6	Fine sandy loam	SM, SC	A–4, A–2
	6–44	Fine sandy loam	SM, SC	A–4, A–2
	44–60	Loamy fine sand	SM, SM–SC	A–2
[1] AhC:				
Anselmo part	0–6	Fine sandy loam	SM, SC	A–4, A–2
	6–44	Fine sandy loam	SM, SC	A–4, A–2
	44–60	Loamy fine sand	SM, SM–SC	A–2
Holt part	0–6	Fine sandy loam	SM, SC, ML, CL	A–4
	6–28	Fine sandy loam, sandy loam	SM, SC, ML, CL	A–2, A–4
	28–60	Unweathered bedrock		
[1] AtD:				
Anselmo part	0–6	Fine sandy loam	SM, SC	A–4, A–2
	6–44	Fine sandy loam	SM, SC	A–4, A–2
	44–60	Loamy fine sand	SM, SM–SC	A–2
Tassel part	0–14	Fine sandy loam	ML, SM, CL, SC	A–4, A–2
	14–60	Unweathered bedrock		
[1] AvA:				
Anselmo part	0–6	Fine sandy loam	SM, SC	A–4, A–2
	6–44	Fine sandy loam	SM, SC	A–4, A–2
	44–60	Loamy fine sand	SM, SM–SC	A–2
Vetal part	0–35	Fine sandy loam	SM, SC, ML, CL	A–4, A–2
	35–60	Fine sandy loam, loamy fine sand, fine sand	SM, SC, ML, CL	A–4, A–2
Bankard:				
[1] Ba	0–3	Silty clay loam	CL	A–6, A–7
	3–60	Stratified sand to loam	SP–SM, SM, SM–SC	A–2
Boro:				
[1] BmC:				
Boro part	0–60	Silty clay	CH, MH	A–7
Millboro part	0–7	Silty clay	CL, CH	A–7
	7–19	Clay, silty clay	CH, MH	A–7
	19–60	Silty clay, clay	CH, MH	A–7
Boyd:				
BnC	0–27	Clay	CH, MH	A–7
	27–60	Unweathered bedrock	CH, MH	A–7
[1] BOD:				
Boyd part	0–27	Clay	CH, MH	A–7
	27–60	Unweathered bedrock	CH, MH	A–7
Okaton part	0–12	Silty clay, shaly clay	CH, MH	A–7
	12–60	Unweathered bedrock	CH, MH	A–7
Bridgeport:				
Bp, Bt	0–11	Silty clay loam	ML, CL	A–4, A–6
	11–60	Silt loam, silty clay loam, loam	ML, CL	A–4, A–6
Canning:				
CaB	0–5	Loam	ML, CL	A–4, A–6
	5–22	Clay loam, sandy clay loam	ML, CL, SC	A–6, A–7
	22–60	Sand and gravel	SM, SM–SC, GM, GM–GC	A–1, A–2

and classifications

Absence of an entry means data were not estimated]

Fragments > 3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
	4	10	40	200		
Pct					*Pct*	
0	100	90–100	90–100	15–30	<25	NP–5
0	100	100	90–100	20–50	20–30	NP–10
0	100	100	90–100	15–30	<25	NP–5
0	100	100	90–100	20–50	20–30	NP–10
0	100	100	90–100	20–50	20–30	NP–10
0	100	100	90–100	15–30	<25	NP–5
0	100	100	90–100	20–50	20–30	NP–10
0	100	100	90–100	20–50	20–30	NP–10
0	100	100	90–100	15–30	<25	NP–5
0	100	95–100	90–100	40–55	15–30	NP–10
0	95–100	95–100	70–100	30–55	20–30	NP–10
0	100	100	90–100	20–50	20–30	NP–10
0	100	100	90–100	20–50	20–30	NP–10
0	100	100	90–100	15–30	<25	NP–5
0	95–100	90–100	70–95	30–55	20–35	NP–10
0	100	100	90–100	20–50	20–30	NP–10
0	100	100	90–100	20–50	20–30	NP–10
0	100	100	90–100	15–30	<25	NP–5
0	100	100	90–100	30–65	15–30	NP–10
0	100	100	90–100	30–65	15–30	NP–10
0	100	100	95–100	75–95	30–45	10–25
0	70–100	60–100	50–70	10–35	<20	NP–5
0	100	100	90–100	80–100	50–80	20–50
0	100	100	90–100	75–100	40–60	15–35
0	100	100	90–100	85–100	50–80	20–50
0	100	95–100	90–100	85–100	50–80	20–50
0	100	95–100	95–100	90–100	50–90	25–65
0	100	95–100	95–100	90–100	60–90	30–65
0	100	95–100	95–100	90–100	50–90	25–65
0	100	95–100	95–100	90–100	60–90	30–65
0	100	95–100	90–100	85–100	50–85	20–50
0	100	95–100	90–100	85–100	50–100	25–65
0	100	100	95–100	75–100	25–40	8–20
0	100	100	95–100	85–100	25–40	8–20
0	100	100	85–100	50–90	30–40	10–20
0	95–100	85–100	60–90	35–80	30–45	10–25
0	40–100	30–80	15–70	5–30	<25	NP–5

TABLE 10.—*Engineering properties*

Soil name and map symbol	Depth	USDA texture	Classification	
			Unified	AASHTO
	In			
[1] CbD:				
Canning part	0–5	Loam	ML, CL	A–4, A–6
	5–22	Clay loam, sandy clay loam	ML, CL, SC	A–6, A–7
	22–60	Sand and gravel	SM, SM–SC, GM, GM–GC	A–1, A–2
Murdo part	0–18	Loam, gravelly loam, clay loam	ML, CL, SM, SC	A–2, A–4, A–6
	18–60	Sand and gravel	GP, GM, SP, SM	A–1, A–2
Carter:				
Cc	0–8	Silty clay loam	CL	A–6, A–7
	8–22	Clay	CH, MH	A–7
	22–60	Clay, silty clay	CH, MH	A–7
Cass:				
Cd	0–17	Fine sandy loam	SM, SC	A–4, A–2
	17–60	Loamy fine sand, fine sand, fine sandy loam	SM	A–2
Chappell:				
ChA	0–15	Fine sandy loam	SM, ML, SC	A–2, A–4
	15–26	Sandy loam, fine sandy loam, gravelly sandy loam.	SM, ML, SC	A–2, A–4
	26–60	Sand and gravel	SP, GP, SP–SM, GP–GM	A–1
[1] CnC:				
Chappell part	0–15	Fine sandy loam	SM, ML, SC, CL	A–2, A–4
	15–26	Sandy loam, fine sandy loam, gravelly sandy loam.	SM, ML, SC, CL	A–2, A–4
	26–60	Sand and gravel	SP, GP, SP–SM, GP–GM	A–1
Dix part	0–12	Gravelly sandy loam, fine sandy loam	SM, SC, SP–SM, SM–SC	A–1, A–2
	12–60	Sand and gravel	SP, GP, SW, GW	A–1
Dix:				
DaA, [1] DbD	0–12	Gravelly sandy loam, fine sandy loam	SM, SC, SP–SM, SM–SC	A–1, A–2
	12–60	Sand and gravel	SP, GP, SW, GW	A–1
Doger:				
DgB	0–35	Loamy fine sand	SM, SP–SM	A–2
	35–60	Loamy fine sand, loamy sand, fine sand	SM, SP–SM	A–2
[1] DmA:				
Doger part	0–35	Loamy fine sand	SM, SP–SM	A–2
	35–60	Loamy fine sand, loamy sand, fine sand	SM, SP–SM	A–2
Elsmere part	0–12	Fine sandy loam	SM, SP–SM	A–4, A–2
	12–60	Fine sand, loamy fine sand, loamy sand	SP–SM, SM–SC, SM	A–2, A–3
Dunday:				
DnC2	0–12	Loamy fine sand	SM, SM–SC	A–2
	12–60	Loamy fine sand, fine sand	SM, SP–SM, SM–SC	A–2, A–3
[1] DuC:				
Dunday part	0–12	Loamy fine sand	SM, SM–SC	A–2
	12–60	Loamy fine sand, fine sand	SM, SP–SM	A–2, A–3
Doger part	0–35	Loamy fine sand	SM, SP–SM	A–2
	35–60	Loamy fine sand, loamy sand, fine sand	SM, SP–SM, SM–SC	A–2

and classifications—Continued

Fragments > 3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
	4	10	40	200		
Pct					*Pct*	
0	100	100	85–100	50–90	30–40	10–20
0	95–100	85–100	60–90	35–80	30–45	10–25
0	40–100	30–80	15–70	5–30	<25	NP–5
0	90–100	60–90	50–80	30–70	25–40	5–20
0	40–80	10–55	5–45	0–30	<25	NP–5
0	100	100	95–100	90–100	30–45	15–25
0	100	100	90–100	90–100	55–80	25–50
0	100	100	90–100	90–100	55–80	25–50
0	100	95–100	85–95	30–65	<25	NP–10
0	95–100	95–100	50–75	15–30	----------	NP
0	90–100	90–100	60–85	30–55	15–30	NP–10
0	90–100	90–100	60–80	30–50	15–30	NP–10
0–5	95–100	30–40	5–30	0–15	----------	NP–5
0	90–100	90–100	60–85	30–55	15–30	NP–10
0	90–100	90–100	60–80	30–50	15–30	NP–10
0–5	95–100	30–40	5–30	0–15	<20	NP–5
0	70–90	40–70	35–50	5–25	<20	NP–10
0–5	45–85	30–50	25–35	0–15	<20	NP–5
0	70–90	40–70	35–50	5–25	<20	NP–10
0–5	45–85	30–50	25–35	0–15	<20	NP–5
0	100	100	95–100	10–35	<25	NP–5
0	100	100	95–100	5–35	<25	NP–5
0	100	100	95–100	10–35	<25	NP–5
0	100	100	95–100	5–35	<25	NP–5
0	100	100	70–85	30–50	15–25	NP–5
0	100	100	60–100	5–30	<25	NP–5
0	100	100	95–100	13–25	<25	NP–5
0	100	100	95–100	5–25	<25	NP–5
0	100	100	95–100	13–25	<25	NP–5
0	100	100	95–100	5–25	<25	NP–5
0	100	100	95–100	10–35	<25	
0	100	100	95–100	5–35	<25	NP–5

TABLE 10.—*Engineering properties*

Soil name and map symbol	Depth	USDA texture	Classification	
			Unified	AASHTO
	In			
Elsmere:				
Em	0–12	Fine sandy loam	SM, SM–SC	A–4, A–2
	12–60	Fine sand, loamy fine sand, loamy sand	SP–SM, SM, SM–SC	A–2, A–3
Epping:				
EpE	0–12	Silt loam	ML, CL	A–4
	12–60	Unweathered bedrock.		
Erd:				
Er	0–20	Clay	CH, MH	A–7
	20–60	Clay	CH, MH	A–7
[1] Es:				
Erd part	0–20	Clay	CH, MH	A–7
	20–60	Clay	CH, MH	A–7
Hurley part	0–2	Silt loam	CL	A–4, A–6
	2–60	Clay	CH, MH	A–7
Haverson:				
Ha	0–7	Loam, silt loam	ML	A–4, A–6
	7–60	Stratified silt loam to very fine sandy loam	ML	A–4, A–6
Holt:				
[1] HbA:				
Holt part	0–6	Fine sandy loam	SM, SC, ML, CL	A–4
	6–28	Fine sandy loam, sandy loam	SM, SC, ML, CL	A–2, A–4
	28–60	Unweathered bedrock		
Anselmo part	0–6	Fine sandy loam	SM, SC	A–4, A–2
	6–44	Fine sandy loam	SM, SC	A–4, A–2
	44–60	Loamy fine sand	SM, SM–SC	A–2
Huggins:				
HgA	0–6	Silt loam	ML, CL	A–4, A–6
	6–21	Silty clay loam, silty clay	CH, CL, MH	A–7
	21–28	Gravelly clay loam, clay loam	CL, SC, CL–ML, SM–SC	A–2, A–4, A–6
	28–60	Unweathered bedrock		
[1] HkB:				
Huggins part	0–6	Silt loam	ML, CL	A–4, A–6
	6–21	Silty clay loam, silty clay	CH, CL, MH	A–7
	21–28	Gravelly clay loam, clay loam	CL, CL–ML, SC	A–2, A–4, A–6
	28–60	Unweathered bedrock		
Kadoka part	0–5	Silt loam	ML, CL	A–4, A–6
	5–28	Silty clay loam, silt loam, loam	CL	A–6, A–7
	28–60	Weathered bedrock		
Hurley:				
Hr	0–2	Silt loam	CL	A–4, A–6
	2–60	Clay	CH, MH	A–7
Inavale:				
Ia, [1] Ic	0–8	Loamy fine sand	SM, SM–SC	A–2
	8–60	Fine sand, loamy fine sand	SP–SM, SM, SM–SC	A–2, A–3
Kadoka:				
KaA	0–5	Silt loam	ML, CL	A–4, A–6
	5–28	Silty clay loam, silt loam, loam	CL	A–6, A–7
	28–60	Weathered bedrock		
[1] KbD:				
Kadoka part	0–5	Silt loam	ML, CL	A–4, A–6
	5–28	Silty clay loam, silt loam, loam	CL	A–6, A–7
	28–60	Weathered bedrock		

and classifications—Continued

Fragments > 3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
	4	10	40	200		
Pct					*Pct*	
0	100	100	70–85	30–50	15–25	NP–5
0	100	100	60–100	5–30	<25	NP–5
0	100	95–100	90–100	70–85	15–30	2–10
0	100	100	95–100	90–100	55–80	25–50
0	100	100	95–100	90–100	55–80	25–50
0	100	100	95–100	90–100	55–80	25–50
0	100	100	95–100	90–100	55–80	25–50
0	100	100	90–100	70–90	30–40	8–15
0	100	100	95–100	90–100	40–90	20–60
0	95–100	95–100	95–100	60–80	25–40	5–15
0	95–100	95–100	95–100	60–80	20–40	5–15
0	100	95–100	90–100	40–55	15–30	NP–10
0	95–100	95–100	70–100	30–55	20–30	NP–10
0	100	100	90–100	20–50	20–30	NP–10
0	100	100	90–100	20–50	20–30	NP–10
0	100	100	90–100	15–30	<25	NP–5
0	100	100	90–100	70–100	25–40	5–20
0	100	100	90–100	80–100	45–70	20–42
0–5	50–85	30–70	30–70	25–60	25–40	5–20
0	100	100	90–100	70–100	25–40	5–20
0	100	100	90–100	80–100	45–70	20–42
0–5	50–85	30–70	30–70	25–60	25–40	5–20
0	100	95–100	90–100	70–100	30–40	5–15
0	100	95–100	90–100	65–100	35–50	10–25
0	100	100	90–100	70–90	30–40	8–15
0	100	100	95–100	90–100	40–90	20–60
0	100	100	85–95	15–35	<25	NP–5
0	100	100	70–90	5–30	<25	NP–5
0	100	95–100	90–100	70–100	30–40	5–15
0	100	95–100	90–100	65–100	35–50	10–25
0	100	95–100	90–100	70–100	30–40	5–15
0	100	95–100	90–100	65–100	35–50	10–25

TABLE 10.—*Engineering properties*

Soil name and map symbol	Depth	USDA texture	Classification	
			Unified	AASHTO
	In			
Epping part	0–12	Silt loam	ML, CL	A–4
	12–60	Unweathered bedrock		
Keya:				
Ke	0–15	Silt loam	ML–CL	A–4, A–6
	15–60	Clay loam, loam	CL	A–6, A–7
Kolls:				
Ko	0–22	Clay	CH, MH	A–7
	22–60	Clay	CH, MH	A–7
Lakoma:				
[1] LkC:				
Lakoma part	0–28	Silty clay	CH, MH	A–7
	28–60	Unweathered bedrock	CH, MH	A–7
Millboro part	0–7	Silty clay	CL, CH	A–7
	7–19	Clay, silty clay	CH, MH	A–7
	19–60	Silty clay, clay	CH, MH	A–7
[1] LoD:				
Lakoma part	0–28	Silty clay	CH, MH	A–7
	28–60	Unweathered bedrock	CH, MH	A–7
Okaton part	0–12	Silty clay, shaly clay	CH, MH	A–7
	12–60	Unweathered bedrock	CH, MH	A–7
Lowry:				
LwA	0–19	Silt loam	ML, CL	A–4, A–6
	19–55	Silt loam, loam, very fine sandy loam	ML, CL	A–4
	55–60	Loamy fine sand	SM, SM–SC	A–2
Manter:				
MaA, MaB	0–7	Fine sandy loam	SM, ML, SC, CL	A–2, A–4
	7–36	Fine sandy loam, sandy loam	SM, ML, CL, SC	A–2, A–4
	36–60	Sandy loam, loamy sand	SM, SC	A–2, A–4
[1] MfE:				
Manter part	0–7	Fine sandy loam	SM, ML, SC, CL	A–2, A–4
	7–36	Fine sandy loam, sandy loam	SM, ML, CL, SC	A–2, A–4
	36–60	Sandy loam, loamy sand	SM, SC	A–2, A–4
Anselmo part	0–6	Fine sandy loam	SM, SC	A–4, A–2
	6–44	Fine sandy loam	SM, SC	A–4, A–2
	44–60	Loamy fine sand	SM, SM–SC	A–2
Marsh:				
Mh.				
Millboro:				
MoA, MoB, MoC	0–7	Silty clay	CL, CH	A–7
	7–19	Clay, silty clay	CH, MH	A–7
	19–60	Silty clay, clay	CH, MH	A–7
Mosher:				
Mr	0–8	Silt loam	ML, CL	A–4, A–6
	8–16	Clay loam, clay	CL, CH	A–7
	16–60	Clay loam, sandy clay loam, clay	CL, CH	A–6, A–7
[1] Ms:				
Mosher part	0–8	Silt loam	ML, CL	A–4, A–6
	8–16	Clay loam, clay	CL, CH	A–7
	16–60	Clay loam, sandy clay loam, clay	CL, CH	A–6, A–7
Jerauld part	0–3	Silt loam	ML, CL	A–4, A–6
	3–10	Silty clay, clay loam, clay	CH, MH	A–7
	10–60	Silty clay, clay loam, clay	CL, CH, MH	A–7

and classifications—Continued

Fragments > 3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
	4	10	40	200		
Pct					*Pct*	
0	100	95–100	90–100	70–85	15–30	20–10
0	100	100	90–100	70–90	25–35	5–15
0	100	95–100	85–100	60–80	30–45	10–25
0	100	100	95–100	85–100	50–90	25–50
0	100	100	95–100	85–100	50–90	25–60
0	100	95–100	90–100	85–100	50–85	20–50
0	95–100	85–100	85–100	85–100	50–100	25–65
0	100	100	90–100	75–100	40–60	15–35
0	100	100	90–100	85–100	50–80	20–50
0	100	95–100	90–100	85–100	50–80	20–50
0	100	95–100	90–100	85–100	50–85	20–50
0	95–100	85–100	85–100	85–100	50–100	25–65
0	100	95–100	90–100	85–100	50–85	20–50
0	100	95–100	90–100	85–100	50–100	25–65
0	100	100	95–100	80–100	25–35	5–15
0	100	100	95–100	70–100	25–40	NP–10
0	100	90–100	70–90	15–30	<25	NP–5
0	100	95–100	90–100	25–55	<25	NP–10
0	100	95–100	90–100	30–55	15–30	NP–10
0	100	95–100	85–100	15–50	<25	NP–10
0	100	95–100	90–100	25–55	<25	NP–10
0	100	95–100	85–100	30–55	15–30	NP–10
0	100	95–100	85–100	20–50	<25	NP–10
0	100	100	90–100	20–50	20–30	NP–10
0	100	100	90–100	20–50	20–30	NP–10
0	100	100	90–100	15–30	<25	NP–5
0	100	100	90–100	75–100	40–60	15–35
0	100	100	90–100	85–100	50–80	20–50
0	100	95–100	90–100	85–100	50–80	20–50
0	100	100	85–100	70–100	25–40	5–20
0	100	95–100	90–100	70–100	40–65	15–40
0	100	95–100	90–100	70–100	35–60	10–35
0	100	100	85–100	70–100	25–40	5–20
0	100	95–100	90–100	70–100	40–65	15–40
0	100	95–100	90–100	70–100	35–60	10–35
0	100	95–100	90–100	65–90	27–40	5–20
0	100	95–100	90–100	75–95	45–70	20–45
0	100	95–100	85–100	75–100	45–85	20–60

TABLE 10.—*Engineering properties*

Soil name and map symbol	Depth	USDA texture	Classification	
			Unified	AASHTO
	In			
Munjor:				
Mu	0–6	Fine sandy loam	SM, SC	A–2, A–4
	6–60	Stratified loam to sand	SM, SC, ML, CL	A–2, A–4
Okaton:				
[1] OAF	0–12	Silty clay, shaly clay	CH, MH	A–7
	12–60	Unweathered bedrock	CH, MH	A–7
[1] OBE:				
Okaton part	0–12	Silty clay, shaly clay	CH, MH	A–7
	12–60	Unweathered bedrock	CH, MH	A–7
Lakoma part	0–28	Silty clay	CH, MH	A–7
	28–60	Unweathered bedrock	CH, MH	A–7
[1] OcF:				
Okaton part	0–12	Silty clay, shaly clay	CH, MH	A–7
	12–60	Unweathered bedrock	CH, MH	A–7
Rock outcrop part.				
Onita:				
On	0–9	Silt loam	ML, CL	A–4, A–6
	9–29	Silty clay loam, clay loam, silty clay	CL, CH	A–6, A–7
	29–60	Silty clay loam, clay loam, silt loam	CL, CH	A–6, A–7
[1] Oo:				
Onita part	0–9	Silt loam	ML, CL	A–6
	9–29	Silty clay loam, clay loam, silty clay	CL, CH	A–6, A–7
	29–60	Silty clay loam, clay loam, silt loam	CL, CH	A–6, A–7
Mosher part	0–8	Silt loam	ML, CL	A–4, A–6
	8–16	Clay loam, clay	CL, CH	A–7
	16–60	Clay loam, sandy clay loam, clay	CL, CH	A–6, A–7
Opal:				
OpC	0–7	Clay	CH, MH	A–7
	7–25	Clay	CH, MH	A–7
	25–60	Unweathered bedrock	CH	A–7
[1] OsE:				
Opal part	0–7	Clay	CH, MH	A–7
	7–25	Clay	CH, MH	A–7
	25–60	Unweathered bedrock	CH	A–7
Sansarc part	0–17	Clay, shaly clay	CH, MH	A–7
	17–60	Unweathered bedrock	CH, MH	A–7
Orwet:				
Ow	0–18	Loam	ML, CL	A–4, A–6
	18–60	Loamy fine sand, fine sandy loam, sand	SM, SC	A–2
Promise:				
PrA, PrB, PrC, PsA	0–8	Clay	CH, MH	A–7
	8–60	Clay	CH, MH	A–7
PtA	0–8	Clay	CH, MH	A–7
	8–36	Clay	CH, MH	A–7
	36–60	Stratified very fine sandy loam to silty clay loam.	CL, SC, CL–ML, SM–SC	A–4, A–6
Ree:				
RaA, RaB, RaC, RaD	0–7	Loam	ML, CL	A–4, A–6
	7–26	Clay loam, sandy clay loam	CL	A–6, A–7
	26–60	Sandy loam, clay loam, loam	CL, ML, SM	A–4, A–6
Reliance:				
ReA, ReB, ReC, ReC2	0–7	Silty clay loam	CL	A–6, A–7
	7–30	Silty clay loam, silty clay	CL, CH	A–6, A–7
	30–60	Silty clay loam, silt loam	CL	A–6, A–7

and classifications—Continued

Fragments > 3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
	4	10	40	200		
Pct					*Pct*	
0	100	95–100	90–100	30–50	10–30	3–10
0	100	95–100	65–85	30–55	10–30	3–10
0	100	95–100	90–100	85–100	50–85	20–50
0	100	95–100	90–100	85–100	50–100	25–65
0	100	95–100	90–100	85–100	50–85	20–50
0	100	95–100	90–100	85–100	50–100	25–65
0	100	95–100	90–100	85–100	50–85	20–50
0	95–100	95–100	85–100	85–100	50–100	25–65
0	100	95–100	90–100	85–100	50–85	20–50
0	100	95–100	90–100	85–100	50–100	25–65
0	100	95–100	90–100	70–100	30–40	10–20
0	100	95–100	90–100	75–100	35–60	10–35
0	95–100	95–100	85–100	65–100	30–55	10–30
0	100	95–100	90–100	70–100	30–40	10–20
0	100	95–100	90–100	75–100	35–60	10–35
0	95–100	95–100	85–100	65–100	30–55	10–30
0	100	100	85–100	70–100	25–40	5–20
0	100	95–100	90–100	70–100	40–65	15–40
0	100	95–100	90–100	70–100	35–60	10–35
0	100	100	90–100	80–100	50–80	20–55
0	100	100	90–100	80–100	50–80	20–55
0	100	95–100	90–100	85–100	50–95	25–65
0	100	100	90–100	80–100	50–80	20–55
0	100	100	90–100	80–100	50–80	20–55
0	100	95–100	90–100	85–100	50–95	25–65
0	100	95–100	90–100	75–100	50–100	25–65
0	100	95–100	90–100	85–100	50–120	30–75
0	95–100	95–100	85–95	60–90	22–35	3–18
0	95–100	95–100	51–85	15–30	<25	NP–10
0	100	100	90–100	80–100	50–70	20–40
0	100	100	90–100	85–100	50–85	25–55
0	100	100	90–100	80–100	50–70	20–40
0	100	100	90–100	85–100	50–85	25–55
0	95–100	85–100	70–95	40–90	20–35	5–15
0	100	95–100	80–100	70–95	30–40	5–15
0	100	90–100	80–100	65–85	30–45	10–25
0	100	85–100	75–100	35–85	25–40	5–20
0	100	100	95–100	80–100	35–45	10–25
0	100	100	95–100	85–100	35–60	15–35
0	100	100	90–100	70–100	30–50	10–30

TABLE 10.—*Engineering properties*

Soil name and map symbol	Depth	USDA texture	Classification	
			Unified	AASHTO
	In			
Ronson:				
RfA	0–8	Fine sandy loam	ML, SM, SC	A–2, A–4
	8–22	Fine sandy loam, sandy loam	ML, SM, SC	A–2, A–4
	22–60	Unweathered bedrock		
[1] RoB:				
Ronson part	0–8	Fine sandy loam	ML, SM, SC	A–2, A–4
	8–22	Fine sandy loam, sandy loam	ML, SM, SC	A–2, A–4
	22–60	Unweathered bedrock		
Tassel part	0–14	Fine sandy loam	ML, SM, SC, CL	A–4, A–2
	14–60	Unweathered bedrock		
Rosebud:				
RsB	0–5	Loam	ML, CL	A–4, A–6
	5–14	Clay loam, loam	CL	A–6
	14–30	Sandy loam, sandy clay loam, very fine sandy loam.	SM, ML, SL, SC	A–4
	30–60	Weathered bedrock		
[1] RuC:				
Rosebud part	0–5	Loam	ML, CL	A–4, A–6
	5–14	Clay loam, loam	CL	A–6
	14–30	Sandy loam, sandy clay loam, very fine sandy loam.	SM, ML, CL, SC	A–4
	30–60	Weathered bedrock		
Canyon part	0–10	Very fine sandy loam, loam	ML, SM, CL, SC	A–4, A–6
	10–60	Weathered bedrock		
[1] RuD:				
Rosebud part	0–5	Loam	ML, CL	A–4, A–6
	5–14	Clay loam, loam	CL	A–6
	14–30	Sandy loam, sandy clay loam, very fine sandy loam.	SM, ML, CL, SC	A–4
	30–60	Weathered bedrock		
Canyon part	0–10	Very fine sandy loam, loam	ML, SM, CL, SC	A–4, A–6
	10–60	Weathered bedrock		
Sansarc:				
[1] SAE:				
Sansarc part	0–17	Clay, shaly clay	CH, MH	A–7
	17–60	Unweathered bedrock	CH, MH	A–7
Opal part	0–7	Clay	CH, MH	A–7
	7–25	Clay	CH, MH	A–7
	25–60	Unweathered bedrock	CH	A–7
[1] ScF:				
Sansarc part	0–17	Clay, shaly clay	CH, MH	A–7
	17–60	Unweathered bedrock	CH, MH	A–7
Shale outcrop part.				
Schamber:				
[1] ShE:				
Schamber part	0–8	Gravelly loam, gravelly sandy loam	SM, GM, SW–SM, GW–GM	A–2, A–1
	8–60	Very gravelly sand	GM, GW, SW, SM	A–1
Murdo part	0–18	Loam, clay loam, gravelly loam	ML, CL, SM, SC	A–2, A–4, A–6
	18–60	Sand and gravel	GP, GM, SP, SM	A–1, A–2
Scott:				
So	0–6	Silt loam	ML	A–4, A–6
	6–60	Silty clay, clay	CH	A–7

and classifications—Continued

Fragments > 3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
	4	10	40	200		
Pct					*Pct*	
0	100	100	60–85	30–55	15–30	NP–10
0	100	100	60–85	30–55	15–30	NP–10
0	100	100	60–85	30–55	15–30	NP–10
0	100	100	60–85	30–55	15–30	NP–10
0	95–100	90–100	70–95	30–55	20–35	NP–10
0	95–100	80–100	80–95	55–75	24–34	8–16
0	95–100	80–100	80–95	60–80	30–40	12–24
0	95–100	80–100	60–85	30–60	20–40	NP–10
0	95–100	80–100	80–95	55–75	24–34	8–16
0	95–100	80–100	80–95	60–80	30–40	12–24
0	95–100	80–100	60–85	30–60	20–40	NP–10
0–5	95–100	75–100	45–95	35–75	20–35	NP–15
0	95–100	80–100	80–95	55–75	24–34	8–16
0	95–100	80–100	80–95	60–80	30–40	12–24
0	95–100	80–100	60–85	30–60	20–40	NP–10
0–5	95–100	75–100	45–95	35–75	20–35	NP–15
0	100	95–100	90–100	75–100	50–100	25–65
0	100	95–100	90–100	85–100	50–120	30–75
0	100	100	90–100	80–100	50–80	20–55
0	100	100	90–100	80–100	50–80	20–55
0	100	95–100	90–100	85–100	50–95	25–65
0	100	95–100	90–100	75–100	50–100	25–65
0	100	95–100	90–100	85–100	50–120	30–75
0–5	55–90	40–75	30–60	10–35	<25	NP–5
0–5	40–70	20–40	10–35	5–15	<25	NP–5
0	90–100	60–90	50–80	30–70	25–40	5–20
0	40–80	10–55	5–45	0–30	<25	NP–5
0	100	100	100	95–100	20–35	2–12
0	100	100	100	95–100	50–75	30–45

TABLE 10.—*Engineering properties*

Soil name and map symbol	Depth	USDA texture	Classification	
			Unified	AASHTO
	In			
Shena:				
SsB	0–5	Silt loam	ML, CL	A–4, A–6
	5–12	Silty clay loam, silty clay	CL, CH, MH	A–7
	12–60	Unweathered bedrock		
Swanboy:				
Sw	0–60	Clay	CH	A–7
Tassel:				
TaE	0–14	Fine sandy loam	ML, SM, CL, SC	A–4, A–2
	14–60	Unweathered bedrock		
[1] TrF:				
Tassel part	0–14	Fine sandy loam	ML, SM, CL, SC	A–4, A–2
	14–60	Unweathered bedrock		
Rock outcrop part.				
Valentine:				
VaD	0–60	Fine sand	SM, SP, SP–SM	A–2, A–3
[1] VdC:				
Valentine part	0–60	Fine sand	SM, SP, SP–SM	A–2, A–3
Dunday part	0–12	Loamy fine sand	SM, SM–SC	A–2
	12–60	Loamy fine sand, fine sand	SM, SP–SM, SM–SC	A–2, A–3
[1] VnD:				
Valentine part	0–60	Fine sand	SM, SP, SP–SM	A–2, A–3
Tassel part	0–14	Fine sandy loam	ML, SM, CL, SC	A–4, A–2
	14–60	Unweathered bedrock		
Vetal:				
Vt	0–35	Fine sandy loam	SM, SC, ML, CL	A–4, A–2
	35–60	Fine sandy loam, fine sand, loamy fine sand	SM, SC, ML, CL	A–4, A–2
Wanblee:				
[1] Wa:				
Wanblee part	0–2	Silt loam	ML, CL	A–4, A–6
	2–8	Clay loam, clay	CL, CH	A–7
	8–20	Clay loam, loam	CL	A–6, A–7
	20–60	Unweathered bedrock		
Wortman part	0–9	Silt loam	CL, ML	A–4, A–6
	9–19	Clay, clay loam, silty clay	CL, CH	A–6, A–7
	19–30	Loam, silt loam	CL, ML	A–4, A–6
	30–60	Unweathered bedrock		
Wann:				
Wb	0–20	Fine sandy loam	SM, SM–SC	A–2, A–4
	20–60	Sandy loam, fine sandy loam, loamy fine sand.	SM, SM–SC	A–2, A–4
Westover:				
WeE	0–24	Loam	ML, CL	A–4, A–6
	24–32	Loamy sand, sand, gravelly sand	ML, SM, SC, CL	A–4, A–6
	32–60		SM, SC, GM, GC	A–1, A–2
Wewela:				
WfA	0–8	Loamy fine sand	SM, SM–SC	A–2
	8–13	Sandy clay loam	SC, CL	A–6
	13–26	Clay, shaly clay	CH, MH	A–7
	26–60	Unweathered bedrock	CH, MH	A–7
WgA, WgB	0–8	Fine sandy loam	ML, SM, CL–ML, SM–SC	A–4
	8–13	Sandy clay loam	SC, CL	A–6
	13–26	Clay, shaly clay	CH, MH	A–7
	26–60	Unweathered bedrock	CH, MH	A–7

and classifications—Continued

Fragments > 3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
	4	10	40	200		
Pct					*Pct*	
0	100	100	90–100	70–90	27–40	5–20
0–5	100	95–100	90–100	85–95	40–70	15–45
0	100	100	90–100	75–95	50–100	30–60
0	95–100	90–100	70–95	30–55	20–35	NP–10
0	95–100	90–100	70–95	30–55	20–35	NP–10
0	100	100	90–100	2–25		NP
0	100	100	90–100	2–25		NP
0	100	100	95–100	13–25	<25	NP–5
0	100	100	95–100	5–25	<25	NP–5
0	100	100	90–100	2–25		NP
0	95–100	90–100	70–95	30–55	20–35	NP–10
0	100	100	90–100	30–65	15–30	NP–10
0	100	100	90–100	30–65	15–30	NP–10
0	100	100	95–100	60–95	25–40	5–20
0	100	100	90–100	70–85	40–70	15–45
0	100	95–100	90–100	65–85	35–50	15–35
0	100	95–100	85–100	60–95	30–40	5–15
0	100	95–100	90–100	70–95	40–75	15–45
0	100	95–100	85–95	60–80	30–45	5–25
0	95–100	95–100	70–85	30–45	<25	NP–5
0	95–100	95–100	50–75	15–30	<20	NP–5
0	100	95–100	85–100	80–100	20–40	5–15
0	100	95–100	70–90	45–80	15–30	5–15
0	40–80	25–75	15–70	5–30	<20	NP–5
0	100	100	50–75	20–35	<25	NP–5
0	100	100	60–100	35–55	30–40	10–20
0	100	95–100	90–100	85–100	55–85	20–50
0	100	95–100	90–100	85–100	50–100	25–65
0	100	100	70–85	40–55	15–30	NP–10
0	100	100	60–100	35–55	30–40	10–20
0	100	95–100	90–100	85–100	55–85	20–50
0	100	95–100	90–100	85–100	50–100	25–65

TABLE 10.—*Engineering properties*

Soil name and map symbol	Depth	USDA texture	Classification	
			Unified	AASHTO
	In			
Whitelake:				
Wh	0–14	Fine sandy loam	ML, SM	A–2, A–4
	14–24	Sandy clay loam, fine sandy loam	ML, SM, SC, CL	A–4, A–6
	24–60	Stratified sand to loam	ML, CL, SM, SC	A–2, A–4
[1] Wk:				
Whitelake part	0–14	Fine sandy loam	ML, SM	A–2, A–4
	14–24	Sandy clay loam, fine sandy loam	ML, SM, SC, CL	A–4, A–6
	24–60	Stratified sand to loam	ML, CL, SM, SC	A–2, A–4
Lute part	0–3	Fine sandy loam	ML, SM	A–2, A–4
	3–10	Sandy clay loam, fine sandy loam	ML, SM, SC, CL	A–4
	10–60	Stratified very fine sandy loam to loamy sand.	ML, CL, SM, SC	A–1, A–2, A–4
Witten:				
Wn	0–9	Silty clay	CH, MH	A–7
	9–26	Clay, silty clay	CH, MH	A–7
	26–60	Clay, silty clay	CH, MH	A–7
Wortman:				
Wo	0–9	Silt loam	CL, ML	A–4, A–6
	9–19	Clay, clay loam, silty clay	CL, CH	A–6, A–7
	19–30	Loam, silt loam	CL, ML	A–4, A–6
	30–60	Unweathered bedrock		

[1] This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

Test data

Table 11 shows the results of tests on selected horizons of four specific soils in Tripp County. The tests were made by the South Dakota Department of Highways in accordance with standard procedures of the American Association of State Highway and Transportation Officials. Some of the terms used in table 11 have not previously been defined, and are defined in the following paragraphs.

Maximum dry density is the maximum unit dry weight of a soil when compacted with optimum moisture by the prescribed method of compaction. The moisture content that gives the highest dry unit weight is the optimum moisture content for the specific method of compaction.

The mechanical analysis shows the percentages, by weight, of soil particles that pass sieves of specified sizes. Sand and other coarse particles do not pass through the No. 200 sieve, but silt and clay pass through it. Percentages of fractions smaller than those passing the No. 200 sieve were determined by the hydrometer method, rather than by the pipette method that most soil scientists use in determining the clay content of soil samples.

Physical and chemical properties

Table 12 shows estimated values for several soil characteristics and features that affect soil behavior in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the representative profile of each soil. They are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships between the soil characteristics observed in the field, particularly structure, porosity, and gradation or texture, that influence the downward movement of water in the soil. The estimates are for water movement in a vertical direction when the soil is saturated. Not considered in the estimates are lateral seepage or such transient features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, texture, and structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as a range in pH. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in

and classifications—Continued

Fragments > 3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
	4	10	40	200		
Pct						
0	100	100	70–100	30–55	15–30	NP–5
0	100	100	60–100	35–55	25–35	6–15
0	100	100	60–100	20–65	15–35	NP–10
0	100	100	70–100	30–55	15–30	NP–5
0	100	100	60–100	35–55	25–35	6–15
0	100	100	60–100	20–65	15–35	NP–10
0	100	100	60–85	30–55	<25	NP–5
0	100	100	60–100	35–55	20–35	5–10
0	100	100	45–100	15–55	15–30	NP–10
0	100	100	95–100	90–100	50–82	30–50
0	100	100	95–100	90–100	50–82	30–60
0	100	100	95–100	90–100	40–70	30–50
0	100	95–100	85–100	60–95	30–40	5–20
0	100	95–100	90–100	70–95	40–75	15–45
0	100	95–100	85–95	60–80	30–45	5–25

selecting the crops and ornamental or other plants to be grown, in evaluating soil amendments for fertility and stabilization, and in evaluating the corrosivity of soils.

Salinity is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25° C. Estimates are based on field and laboratory measurements at representative sites of the nonirrigated soils. Salinity of individual irrigated fields is largely affected by the quality of the irrigation water and the irrigation practices. Hence, it can differ greatly from the value given in table 12. Salinity affects the suitability of a soil for crop production, its stability when used as construction material, and its potential to corrode metal and concrete.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others it was estimated on the basis of the kind of clay and on measurements of similar soils. Size of imposed loadings and the magnitude of changes in soil moisture content are also important factors that influence the swelling of soils. Shrinking and swelling of some soils can damage building foundations, basement walls, roads, and other structures unless special designs are used. A *high* shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion, as used in table 12, pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, soil texture, and acidity. Protective measures for steel or more resistant concrete help to avoid or to minimize damage resulting from the corrosion. Installations of steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely within one kind of soil or within one soil horizon.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. In estimating annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Wind erodibility groups are made up of soils that have similar properties that affect their resistance to soil blowing if cultivated. The groups are used to predict the susceptibility of soil to blowing and the amount

TABLE 11.—*Engineering*

Soil name and location	Parent material	Depth	Moisture density [1]	
			Maximum dry density	Optimum moisture content
		In	*Lb/cu ft*	*Pct*
Erd clay: 100 feet south and 75 feet west of the NE corner of sec. 35, T. 100 N., R. 77. W.	Alluvial clay	10–20	89	29
		28–37	93	26
Lakoma silty clay: 225 feet west and 75 feet north of the SE corner of sec. 35, T. 101 N., R. 76 W.	Weathered clay shale	5–12	84	28
		12–22	86	30
		28–60	84	33
Lute fine sandy loam: 1,425 feet north and 210 feet east of the SW corner of sec. 16, T. 97 N., R. 78 W.	Sandy alluvium	3–10	106	19
		18–43	120	12
Whitelake fine sandy loam: 1,410 feet north and 215 feet east of the SW corner of sec. 16, T. 97 W. R. 78 W.	Sandy alluvium	0–10	112	16
		14–19	101	21
		33–41	123	12
		41–60	106	19

[1] Based on Moisture-density Relations of Soils Using 5.5-lb. Rammer and 12-in. Drop, AASHTO Designation T. 99, Method.
[2] Mechanical analyses according to the AASHTO Designation T. 88. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

of soil lost as a result of blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are extremely erodible, so vegetation is difficult to establish. They are generally not suitable for crops.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible, but crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing are used.
5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible, but crops can be grown if measures to control soil blowing are used.
6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible, and crops can easily be grown.
7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible, and crops can easily be grown.
8. Stony or gravelly soils and other soils not subject to soil blowing.

Soil and water features

Features that relate to runoff or infiltration of water, to flooding, to grading and excavation, and to subsidence and frost action of each soil are indicated in table 13. This information is helpful in planning land uses and engineering projects that are likely to be affected by the amount of runoff from watersheds, by

test data

Mechanical analysis							Liquid limit	Plasticity index	Classification	
Percentage passing sieve—[3]			Percentage smaller than—[3]						AASHTO [3]	Unified [4]
< 3 in	No. 4	No. 10	No. 40	No. 200	0.005 mm	0.002 mm				
							Pct			
----------	100	96	96	94	64	----------	69	37	A-7-5(20)	MH-CH
----------	----------	----------	100	96	61	----------	59	30	A-7-6(19)	MH-CH
----------	----------	100	99	98	62	----------	63	25	A-7-5(18)	MH
----------	----------	----------	100	99	71	----------	66	30	A-7-5(20)	MH
----------	95	86	86	85	64	----------	74	38	A-7-5(20)	MH
----------	----------	100	96	46	18	----------	28	7	A-4(2)	SM-SC
----------	----------	100	91	23	8	----------	19	4	A-2-4(0)	SM-SC
----------	----------	100	97	30	8	----------	19	NP	A-2-4(0)	SM
----------	----------	100	98	50	32	----------	34	13	A-6(4)	SC
----------	----------	100	90	22	10	----------	15	1	A-2-4(0)	SM
----------	----------	100	98	67	20	----------	30	7	A-4(6)	CL-ML

[3] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1, Ed. 8): The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHTO Designation M 145-49.
[4] Based on the Unified Soil Classification System, Technical Memorandum No. 3-357, Volume 1, Waterways Experiment Station, Corps of Engineers, March 1953.

flooding and a seasonal high water table, by the presence of bedrock or a cemented pan in the upper 5 or 6 feet of the soil, or by frost action.

Hydrologic groups are used to estimate runoff after rainfall. Soil properties that influence the minimum rate of infiltration into the bare soil after prolonged wetting are depth to a water table, intake rate and permeability after prolonged wetting, and depth to layers of slowly permeable or very slowly permeable soil.

Flooding is rated in general terms that describe the frequency, duration, and period of the year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, such as thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; absence of distinctive soil horizons that form in soils that are not subject to flooding; local information about floodwater heights and the extent of flooding; and local knowledge that relates the unique landscape position of each soil to historic floods.

The generalized description of flood hazards is of value in land use planning and provides a valid basis for land use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

A high water table is the highest level in the soil of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed during the course of the soil survey. Indicated are the depth to the seasonal high water table; the kind of water table —perched, artesian, or apparent (the upper surface of ground water); and the months that the water table commonly is present. Only those saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, for specific kinds of drainage systems, and for footing drains to insure dry basements. Such information is also needed in deciding whether or not to construct basements and to determine how septic tank absorption fields and other underground installa-

TABLE 12.—*Physical and chemical*

[Dashes indicate data were not available. The symbol < means less than; > means greater than. The

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity
	In	*In/hr*	*In/in*	*pH*	*Mmhos/cm*
Anselmo:					
AaB2	0–10	>6.0	0.10–0.12	6.1–7.8	<2
	10–44	2.0–6.0	0.15–0.17	6.1–7.8	<2
	44–60	6.0–20	0.09–0.11	6.1–8.4	<2
AbB, AbC, AbD	0–6	2.0–6.0	0.16–0.18	6.1–7.8	<2
	6–44	2.0–6.0	0.15–0.17	6.6–7.8	<2
	44–60	6.0–20	0.09–0.11	6.1–8.4	<2
[1] AhC:					
Anselmo part	0–6	2.0–6.0	0.16–0.18	6.1–7.8	<2
	6–44	2.0–6.0	0.15–0.17	6.1–7.8	<2
	44–60	6.0–20	0.09–0.11	6.1–8.4	<2
Holt part	0–6	0.6–6.0	0.14–0.17	6.6–7.8	<2
	6–28	0.6–6.0	0.10–0.16	6.6–7.8	<2
	28–60			7.4–8.4	
[1] AtD:					
Anselmo part	0–6	2.0–6.0	0.16–0.18	6.1–7.8	<2
	6–44	2.0–6.0	0.15–0.17	6.1–7.8	<2
	44–60	6.0–20	0.09–0.11	6.1–8.4	<2
Tassel part	0–14	2.0–6.0	0.16–0.18	7.4–8.4	<2
	14–60				
[1] AvA:					
Anselmo part	0–6	2.0–6.0	0.16–0.18	6.1–7.8	<2
	6–44	2.0–6.0	0.15–0.17	6.1–7.8	<2
	44–60	6.0–20	0.09–0.11	6.1–8.4	<2
Vetal part	0–35	2.0–6.0	0.14–0.17	6.6–7.8	<2
	35–60	2.0–6.0	0.12–0.15	6.6–7.8	<2
Bankard:					
[1] Ba	0–3	0.06–2.0	0.17–0.20	7.4–8.4	<2
	3–60	6.0–20	0.05–0.08	7.4–8.4	<2
Boro:					
[1] BmC:					
Boro part	0–60	0.06–0.2	0.08–0.12	7.4–8.4	<2
Millboro part	0–7	0.06–0.2	0.13–0.19	6.6–7.8	<2
	7–19	0.06–0.2	0.08–0.16	6.6–7.8	<2
	19–60	0.06–0.2	0.08–0.16	7.9–8.4	2–4
Boyd:					
BnC	0–27	<0.2	0.08–0.14	6.6–8.4	<2
	27–60	<0.06		6.6–8.4	<2
[1] BOD:					
Boyd part	0–27	<0.2	0.08–0.14	6.6–8.4	<2
	27–60	<0.06		6.6–8.4	<2
Okaton part	0–12	0.06–0.2	0.11–0.16	7.4–8.4	<2
	12–60	<0.06		7.4–8.4	<2
Bridgeport:					
Bp, Bt	0–11	0.6–2.0	0.20–0.24	7.4–8.4	<2
	11–60	0.6–2.0	0.17–0.22	7.4–8.4	<2
Canning:					
CaB	0–5	0.6–2.0	0.18–0.22	6.1–7.3	<2
	5–22	0.6–2.0	0.17–0.20	6.6–7.8	<2
	22–60	6.0–20	0.03–0.06	7.4–8.4	<2

properties of soils

erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not estimated]

Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
	Uncoated steel	Concrete	K	T	
Low	Moderate	Low	0.20	5–4	2
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.20	5–4	3
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.20	5–4	3
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.20	4	3
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.20	5–4	8
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.24	2	8
Low	Moderate	Low	0.20	5–4	3
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.20	5	3
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.17	5	8
Low	Moderate	Low	0.10		
High	High	Moderate	0.37	5–4	4
High	High	Low	0.37	5–4	4
High	High	Low	0.37		
High	High	Moderate	0.37		
High	High	Moderate	0.37	4–3	4
High	High	Moderate			
High	High	Moderate	0.37	4–3	8
High	High	Moderate			
High	High	Moderate	0.37	2	8
High	High	Moderate			
Low	Low	Low	0.32	5	7
Low	Moderate	Low	0.43		
Moderate	Low	Low	0.28	4–3	6
Moderate	Moderate	Low	0.28		
Low	Moderate	Low	0.10		

TABLE 12.—*Physical and chemical*

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity
	In	*In/hr*	*In/in*	*pH*	*Mmhos/cm*
[1] CbD:					
Canning part	0–5	0.6–2.0	0.18–0.22	6.1–7.3	<2
	5–22	0.6–2.0	0.17–0.20	6.6–7.8	<2
	22–60	6.0–20	0.03–0.06	7.4–8.4	<2
Murdo part	0–18	0.6–6.0	0.17–0.22	6.1–7.8	<2
	18–60	6.0–20	0.03–0.06	7.4–8.4	<2
Carter:					
Cc	0–8	0.6–2.0	0.19–0.22	6.6–7.8	<2
	8–22	<0.06	0.08–0.14	6.6–8.4	<2
	22–60	<0.2	0.08–0.12	7.4–8.4	2–8
Cass:					
Cd	0–17	2.0–6.0	0.16–0.18	5.6–7.3	<2
	17–60	2.0–20	0.08–0.10	6.1–8.4	<2
Chappell:					
ChA	0–15	2.0–6.0	0.13–0.18	6.1–7.3	<2
	15–26	2.0–6.0	0.12–0.17	6.1–8.4	<2
	26–60	6.0–20	0.02–0.04	6.6–8.4	<2
[1] CnC:					
Chappell part	0–15	2.0–6.0	0.13–0.18	6.1–7.3	<2
	15–26	2.0–6.0	0.12–0.17	6.1–8.4	<2
	26–60	6.0–20	0.02–0.04	6.6–8.4	<2
Dix part	0–12	6.0–20	0.10–0.12	6.6–7.8	<2
	12–60	6.0–20	0.02–0.04	6.6–8.4	<2
Dix:					
DaA, [1] DbD	0–12	6.0–20	0.10–0.12	6.6–7.8	<2
	12–60	6.0–20	0.02–0.04	6.6–8.4	<2
Doger:					
DgB	0–35	6.0–20	0.08–0.12	6.1–7.8	<2
	35–60	6.0–20	0.06–0.10	6.1–7.8	<2
[1] DmA:					
Doger part	0–35	6.0–20	0.08–0.12	6.1–7.8	<2
	35–60	6.0–20	0.06–0.10	6.1–7.8	<2
Elsmere part	0–12	2.0–6.0	0.14–0.17	5.6–7.8	<2
	12–60	6.0–20	0.06–0.08	5.6–7.8	<2
Dunday:					
DnC2	0–12	2.0–6.0	0.10–0.12	6.1–7.3	<2
	12–60	2.0–20	0.09–0.11	6.1–7.8	<2
[1] DuC:					
Dunday part	0–12	2.0–6.0	0.10–0.12	6.1–7.3	<2
	12–60	2.0–20	0.09–0.11	6.1–7.8	<2
Doger part	0–35	6.0–20	0.08–0.12	6.1–7.8	<2
	35–60	6.0–20	0.06–0.10	6.1–7.8	<2
Elsmere:					
Em	0–12	2.0–6.0	0.14–0.17	5.6–7.8	<2
	12–60	6.0–20	0.06–0.08	5.6–7.8	<2
Epping:					
EpE	0–12	0.6–2.0	0.21–0.23	7.4–8.4	<2
	12–60				
Erd:					
Er	0–20	<0.06	0.10–0.14	7.4–8.4	2–8
	20–60	<0.06	0.08–0.10	7.4–8.4	8–16

properties of soils—Continued

Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
	Uncoated steel	Concrete	K	T	
Moderate	Low	Low	0.28	4–3	8
Moderate	Moderate	Low	0.28		
Low	Moderate	Low	0.10		
Low	Moderate	Low	0.24	2	8
Low	Moderate	Low	0.10		
Moderate	Moderate	Low	0.37	3–2	7
High	High	Moderate	0.37		
High	High	Moderate	0.37		
Low	Moderate	Low	0.20	5	3
Low	Moderate	Low	0.20		
Low	Low	Low	0.20	3	3
Low	Low	Low	0.20		
Low	Low	Low	0.10		
Low	Low	Low	0.20	3	3
Low	Low	Low	0.20		
Low	Low	Low	0.10		
Low	Low	Low	0.15	2	8
Low	Low	Low	0.15		
Low	Low	Low	0.15	2	8
Low	Low	Low	0.15		
Low	Low	Low	0.17	5	2
Low	Low	Low	0.17		
Low	Low	Low	0.17	5	2
Low	Low	Low	0.17		
Low	Moderate	Low	0.17	5	3
Low	Moderate	Low	0.17		
Low	Low	Low	0.17	5	8
Low	Low	Low	0.17		
Low	Low	Low	0.17	5	8
Low	Low	Low	0.17		
Low	Low	Low	0.17	5	8
Low	Low	Low	0.17		
Low	Moderate	Low	0.17	5	3
Low	Moderate	Low	0.17		
Low	High	Low	0.37	2	8
High	High	High	0.37	5	4
High	High	High	0.37		

TABLE 12.—*Physical and chemical*

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity
	In	*In/hr*	*In/in*	*pH*	*Mmhos/cm*
[1] Es:					
Erd part	0–20	<0.06	0.10–0.14	7.4–8.4	2–8
	20–60	<0.06	0.08–0.10	7.4–8.4	8–16
Hurley part	0–2	0.6–2.0	0.19–0.22	6.1–7.3	<2
	2–60	<0.06	0.05–0.13	7.4–9.0	4–16
Haverson:					
Ha	0–7	0.6–2.0	0.16–0.20	6.6–8.4	<2
	7–60	0.6–2.0	0.16–0.20	7.4–8.4	<2
Holt:					
[1] HbA:					
Holt part	0–6	0.6–6.0	0.14–0.17	6.6–7.8	<2
	6–28	0.6–6.0	0.10–0.16	6.6–7.8	<2
	28–60			7.4–8.4	
Anselmo part	0–6	2.0–6.0	0.16–0.18	6.1–7.8	<2
	6–44	2.0–6.0	0.15–0.17	6.1–7.8	<2
	44–60	6.0–20	0.09–0.11	6.1–8.4	<2
Huggins:					
HgA	0–6	0.6–2.0	0.19–0.22	6.6–7.8	<2
	6–21	0.2–0.6	0.12–0.18	6.6–7.8	<2
	21–28	0.2–0.6	0.17–0.20	7.4–8.4	<2
	28–60			7.4–8.4	
[1] HkB:					
Huggins part	0–6	0.6–2.0	0.19–0.22	6.6–7.8	<2
	6–21	0.2–0.6	0.12–0.18	6.6–7.8	<2
	21–28	0.2–0.6	0.17–0.20	7.4–8.4	<2
	28–60			7.4–8.4	
Kadoka part	0–5	0.6–2.0	0.19–0.22	6.6–7.8	<2
	5–28	0.6–2.0	0.18–0.21	6.6–7.8	<2
	28–60			7.4–8.4	
Hurley:					
Hr	0–2	0.6–2.0	0.19–0.22	6.1–7.3	<2
	2–60	<0.06	0.05–0.13	7.4–9.0	4–16
Inavale:					
Ia, [1] Ic	0–8	6.0–20	0.07–0.12	6.6–8.4	<2
	8–60	6.0–20	0.05–0.07	6.6–8.4	<2
Kadoka:					
KaA	0–5	0.6–2.0	0.19–0.22	6.6–7.8	<2
	5–28	0.6–2.0	0.18–0.21	6.6–7.8	<2
	28–60			7.4–8.4	
[1] KbD:					
Kadoka part	0–5	0.6–2.0	0.19–0.22	6.6–7.8	<2
	5–28	0.6–2.0	0.18–0.21	6.6–7.8	<2
	28–60			7.4–8.4	
Epping part	0–12	0.6–2.0	0.21–0.23	7.4–8.4	<2
	12–60				
Keya:					
Ke	0–15	0.6–2.0	0.19–0.22	6.6–7.3	<2
	15–60	0.6–2.0	0.16–0.22	6.6–7.8	<2
Kolls:					
Ko	0–22	<0.06	0.10–0.14	7.4–8.4	<2
	22–60	<0.06	0.08–0.12	7.4–8.4	<2

properties of soils—Continued

Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
	Uncoated steel	Concrete	K	T	
High	High	High	0.37	5	4
High	High	High	0.37		
Low	High	Low	0.43	1	8
High	High	Moderate	0.43		
Low	High	Low	0.28	5	4L
Low	High	Low	0.28		
Low	Moderate	Low	0.20	4	3
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.20	5–4	3
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.32	3–2	6
High	High	Low	0.32		
Moderate	High	Low	0.32		
Low	Moderate	Low	0.32	3–2	6
High	High	Low	0.32		
Moderate	High	Low	0.32		
Low	Moderate	Low	0.32	4	6
Moderate	Moderate	Low	0.43		
Low	Moderate	Low			
Low	High	Low	0.43	1	8
High	High	Moderate	0.43		
Low	High	Low	0.17	5	2
Low	High	Low	0.17		
Low	Moderate	Low	0.32	4	6
Moderate	Moderate	Low	0.43		
Low	Moderate	Low			
Low	Moderate	Low	0.32	4	6
Moderate	Moderate	Low	0.43		
Low	Moderate	Low			
Low	High	Low	0.37	2	8
Moderate	Moderate	Low	0.28	5	6
Moderate	Moderate	Low	0.28		
High	High	Low	0.37	5	8
High	High	Moderate	0.37		

TABLE 12.—*Physical and chemical*

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity
	In	*In/hr*	*In/in*	*pH*	*Mmhos/cm*
Lakoma:					
[1]LkC:					
Lakoma part	0–28	0.06–0.2	0.08–0.12	7.4–8.4	<2
	28–60	<0.06		7.4–8.4	<2
Millboro part	0–7	0.06–0.2	0.13–0.19	6.6–7.8	<2
	7–19	0.06–0.2	0.08–0.16	6.6–7.8	<2
	19–60	0.06–0.2	0.08–0.16	7.9–8.4	2–4
[1] LoD:					
Lakoma part	0–28	0.06–0.2	0.08–0.12	7.4–8.4	<2
	28–60	<0.06		7.4–8.4	<2
Okaton part	0–12	0.06–0.2	0.11–0.16	7.4–8.4	<2
	12–60	<0.06		7.4–8.4	<2
Lowry:					
LwA	0–19	0.6–2.0	0.19–0.22	6.6–8.4	<2
	19–55	0.6–2.0	0.15–0.20	7.4–8.4	<2
	55–60	6.0–20	0.08–0.10	7.4–8.4	<2
Manter:					
MaA, MaB	0–7	2.0–6.0	0.12–0.16	6.6–7.8	<2
	7–36	2.0–6.0	0.11–0.14	6.6–7.8	<2
	36–60	2.0–6.0	0.11–0.14	7.4–8.4	<2
[1] MfE:					
Manter part	0–7	2.0–6.0	0.12–0.16	6.6–7.8	<2
	7–36	2.0–6.0	0.11–0.14	6.6–7.8	<2
	36–60	2.0–6.0	0.11–0.14	7.4–8.4	<2
Anselmo part	0–6	2.0–6.0	0.16–0.18	6.1–7.8	<2
	6–44	2.0–6.0	0.15–0.17	6.1–7.8	<2
	44–60	6.0–20	0.09–0.11	6.1–8.4	<2
Marsh:					
Mh.					
Millboro:					
MoA, MoB, MoC	0–7	0.06–0.2	0.13–0.19	6.6–7.8	<2
	7–19	0.06–0.2	0.08–0.16	6.6–7.8	<2
	19–60	0.06–0.2	0.08–0.16	7.9–8.4	2–4
Mosher:					
Mr	0–8	0.6–2.0	0.18–0.22	6.1–7.8	<2
	8–16	<0.06	0.08–0.19	7.4–8.4	2–4
	16–60	0.06–0.2	0.11–0.22	7.9–9.0	4–16
[1] Ms:					
Mosher part	0–8	0.6–2.0	0.18–0.22	6.1–7.8	<2
	8–16	<0.06	0.08–0.19	7.4–8.4	2–4
	16–60	0.06–0.2	0.11–0.22	7.9–9.0	4–16
Jerauld part	0–3	0.6–2.0	0.18–0.22	5.6–7.3	<4
	3–10	<0.2	0.10–0.15	6.6–8.4	4–16
	10–60	<0.2	0.08–0.17	7.4–9.0	4–16
Munjor:					
Mu	0–6	2.0–6.0	0.14–0.20	7.4–8.4	<2
	6–60	2.0–6.0	0.13–0.18	7.4–8.4	<2
Okaton:					
[1] OAF	0–12	0.06–0.2	0.11–0.16	7.4–8.4	<2
	12–60	<0.06		7.4–8.4	<2
[1] OBE:					
Okaton part	0–12	0.06–0.2	0.11–0.16	7.4–8.4	<2
	12–60	<0.06		7.4–8.4	<2

properties of soils—Continued

Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
	Uncoated steel	Concrete	K	T	
High	High	Moderate	0.37	4–3	4
High	High	Moderate	0.37		
High	High	Low	0.37	5–4	4
High	High	Low	0.37		
High	High	Moderate	0.37		
High	High	Moderate	0.37	4–3	8
High	High	Moderate			
High	High	Moderate	0.37	2	8
High	High	Moderate			
Low	Moderate	Low	0.32	5–4	5
Low	Moderate	Low	0.43		
Low	Moderate	Low	0.10		
Low	Moderate	Low	0.15	5	3
Low	Moderate	Low	0.15		
Low	High	Low	0.15		
Low	Moderate	Low	0.15	5	8
Low	Moderate	Low	0.15		
Low	High	Low	0.15		
Low	Moderate	Low	0.20	5–4	8
Low	Moderate	Low	0.20		
Low	Moderate	Low	0.20		
High	High	Low	0.37	5–4	4
High	High	Low	0.37		
High	High	Moderate	0.37		
Moderate	Moderate	Moderate	0.43	4–3	6
High	High	Moderate	0.32		
High	High	Moderate	0.32		
Moderate	Moderate	Moderate	0.43	4–3	6
High	High	Moderate	0.32		
High	High	Moderate	0.32		
Moderate	Moderate	Low	0.43	2	8
High	High	Moderate	0.32		
High	High	Moderate	0.32		
Low	Moderate	Low	0.20	5	3
Low	Moderate	Low	0.20		
High	High	Moderate	0.37	2	8
High	High	Moderate			
High	High	Moderate	0.37	2	8
High	High	Moderate			

TABLE 12.—*Physical and chemical*

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity
	In	*In/hr*	*In/in*	*pH*	*Mmhos/cm*
Lakoma part	0–28	0.06–0.2	0.08–0.12	7.4–8.4	<2
	28–60	<0.06		7.4–8.4	<2
[1] OcF:					
Okaton part	0–12	0.06–0.2	0.11–0.16	7.4–8.4	<2
	12–60	<0.06		7.4–8.4	<2
Rock outcrop part.					
Onita:					
On	0–9	0.6–2.0	0.19–0.22	5.6–7.3	<2
	9–29	0.2–0.6	0.11–0.17	6.1–7.3	<2
	29–60	0.2–0.6	0.17–0.20	7.4–8.4	<2
[1] Oo:					
Onita part	0–9	0.6–2.0	0.19–0.22	5.6–7.3	<2
	9–29	0.2–0.6	0.11–0.17	6.1–7.3	<2
	29–60	0.2–0.6	0.17–0.20	7.4–8.4	<2
Mosher part	0–8	0.6–2.0	0.18–0.22	6.1–7.8	<2
	8–16	<0.06	0.08–0.19	7.4–8.4	2–4
	16–60	0.06–0.2	0.11–0.22	7.9–9.0	4–16
Opal:					
OpC	0–7	<0.06	0.10–0.14	6.6–8.4	<2
	7–25	<0.06	0.08–0.14	7.4–8.4	<2
	25–60	<0.06		6.6–8.4	<2
[1] OsE:					
Opal part	0–7	<0.06	0.10–0.14	6.6–8.4	<2
	7–25	<0.06	0.08–0.14	7.4–8.4	<2
	25–60	<0.06		6.6–8.4	<2
Sansarc part	0–17	0.06–0.2	0.08–0.12	6.6–8.4	<2
	17–60			5.6–8.4	<2
Orwet:					
Ow	0–18	0.6–2.0	0.20–0.24	7.4–8.4	<2
	18–60	6.0–20	0.09–0.11	6.6–8.4	<2
Promise:					
PrA, PrB, PrC, PsA	0–8	<0.2	0.10–0.14	6.1–7.8	<2
	8–60	<0.06	0.08–0.14	7.4–9.0	<2
PtA	0–8	<0.2	0.10–0.14	6.1–7.8	<2
	8–36	<0.06	0.08–0.14	7.4–9.0	<2
	36–60	0.6–2.0	0.15–0.20	7.4–9.0	<2
Ree:					
RaA, RaB, RaC, RaD	0–7	0.6–2.0	0.18–0.22	6.1–7.3	<2
	7–26	0.6–2.0	0.17–0.22	6.6–8.4	<2
	26–60	0.6–2.0	0.09–0.20	7.9–8.4	<2
Reliance:					
ReA, ReB, ReC, ReC2	0–7	0.2–0.6	0.19–0.22	6.1–7.3	<2
	7–30	0.2–0.6	0.11–0.19	6.6–7.8	<2
	30–60	0.2–2.0	0.17–0.20	7.4–8.4	<2
Ronson:					
RfA	0–8	2.0–6.0	0.11–0.17	6.6–8.4	<2
	8–22	2.0–6.0	0.09–0.15	7.4–8.4	<2
	22–60			7.9–8.4	<2
[1] RoB:					
Ronson part	0–8	2.0–6.0	0.11–0.17	6.6–8.4	<2
	8–22	2.0–6.0	0.09–0.15	7.4–8.4	<2
	22–60			7.9–8.4	<2

properties of soils—Continued

Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
	Uncoated steel	Concrete	K	T	
High	High	Moderate	0.37	4–3	8
High	High	Moderate			
High	High	Moderate	0.37	2	8
High	High	Moderate			
Moderate	Moderate	Low	0.28	5	6
High	High	Low	0.28		
High	High	Low	0.28		
Moderate	Moderate	Low	0.28	5	6
High	High	Low	0.28		
High	High	Low	0.28		
Moderate	Moderate	Moderate	0.43	4–3	6
High	High	Moderate	0.32		
High	High	Moderate	0.32		
High	High	Low	0.37	4–3	4
High	High	Low	0.37		
High	High	Moderate			
High	High	Low	0.37	4–3	8
High	High	Low	0.37		
High	High	Moderate			
High	High	Moderate	0.37	2	8
High	High	Moderate			
Low	High	Moderate	0.32	5	4L
Low	High	Moderate	0.17		
High	High	Low	0.37	5–4	4
High	High	Low	0.37		
High	High	Low	0.37	5–4	4
High	High	Low	0.37		
Low	High	Low	0.37		
Moderate	Moderate	Low	0.28	5	6
Moderate	Moderate	Low	0.28		
Moderate	High	Low	0.28		
High	Moderate	Low	0.32	5–4	7
High	High	Low	0.32		
High	High	Low	0.32		
Low	Moderate	Low	0.20	4–3	3
Low	Moderate	Low	0.20		
Low	Moderate	Low			
Low	Moderate	Low	0.20	4–3	3
Low	Moderate	Low	0.20		
Low	Moderate	Low			

TABLE 12.—*Physical and chemical*

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity
	In	*In/hr*	*In/in*	*pH*	*Mmhos/cm*
Tassel part	0–14	2.0–6.0	0.16–0.18	7.4–8.4	<2
	14–60				
Rosebud:					
RsB	0–5	0.6–2.0	0.22–0.24	6.6–8.4	<2
	5–14	0.2–0.6	0.15–0.17	6.6–8.4	<2
	14–30	0.2–2.0	0.11–0.17	7.4–8.4	<2
	30–60				
[1] RuC:					
Rosebud part	0–5	0.6–2.0	0.22–0.24	6.6–8.4	<2
	5–14	0.2–0.6	0.15–0.17	6.6–8.4	<2
	14–30	0.2–2.0	0.11–0.17	7.4–8.4	<2
	30–60				
Canyon part	0–10	0.6–2.0	0.20–0.22	7.4–8.4	<2
	10–60				
[1] RuD:					
Rosebud part	0–5	0.6–2.0	0.22–0.24	6.6–8.4	<2
	5–14	0.2–0.6	0.15–0.17	6.6–8.4	<2
	14–30	0.2–2.0	0.11–0.17	7.4–8.4	<2
	30–60				
Canyon part	0–10	0.6–2.0	0.20–0.22	7.4–8.4	<2
	10–60				
Sansarc:					
[1] SAE:					
Sansarc part	0–17	0.06–0.2	0.08–0.12	6.6–8.4	<2
	17–60			5.6–8.4	<2
Opal part	0–7	<0.06	0.10–0.14	6.6–8.4	<2
	7–25	<0.06	0.08–0.14	7.4–8.4	<2
	25–60	<0.06		6.6–8.4	<2
[1] ScF:					
Sansarc part	0–17	0.06–0.2	0.08–0.12	6.6–8.4	<2
	17–60			5.6–8.4	<2
Shale outcrop part.					
Schamber:					
[1] ShE:					
Schamber part	0–8	0.6–6.0	0.12–0.15	6.6–8.4	<2
	8–60	6.0–20	0.03–0.06	7.9–8.4	<2
Murdo part	0–18	0.6–6.0	0.17–0.22	6.1–7.8	<2
	18–60	6.0–20	0.03–0.06	7.4–8.4	<2
Scott:					
So	0–6	0.6–2.0	0.22–0.24	6.1–6.5	<2
	6–60	<0.06	0.11–0.13	6.6–8.4	<2
Shena:					
SsB	0–5	0.6–2.0	0.19–0.22	6.6–7.8	<2
	5–12	0.2–0.6	0.12–0.18	6.6–7.8	<2
	12–60				
Swanboy:					
Sw	0–60	<0.06	0.05–0.09	6.6–9.0	<2
Tassel:					
TaE	0–14	2.0–6.0	0.16–0.18	7.4–8.4	<2
	14–60				

properties of soils—Continued

Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
	Uncoated steel	Concrete	K	T	
Low	Moderate	Low	0.24	2	8
Low	High	Low	0.28	4–3	5
Moderate	High	Low	0.28		
Moderate	High	Low	0.28		
Low	High	Low	0.28	4–3	5
Moderate	High	Low	0.28		
Moderate	High	Low	0.28		
Low	Low	Low	0.28	2	8
Low	High	Low	0.28	4–3	5
Moderate	High	Low	0.28		
Moderate	High	Low	0.28		
Low	Low	Low	0.28	2	8
High	High	Moderate	0.37	2	8
High	High	Moderate			
High	High	Low	0.37	4–3	8
High	High	Low	0.37		
High	High	Moderate			
High	High	Moderate	0.37	2	8
High	High	Moderate			
Low	Low	Low	0.17	2	8
Low	Moderate	Low	0.10		
Low	Moderate	Low	0.24	2	8
Low	Moderate	Low	0.10		
Moderate	High	Low			6
High	High	Low			
Low	Moderate	Low	0.43	1	8
High	High	Low	0.43		
High	High	Moderate	0.28	5	8
Low	Moderate	Low	0.24	1	8

TABLE 12.—*Physical and chemical*

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity
	In	*In/hr*	*In/in*	*pH*	*Mmhos/cm*
[1] TrF:					
Tassel part	0–14	2.0–6.0	0.16–0.18	7.4–8.4	<2
	14–60				
Rock outcrop part.					
Valentine:					
VaD	0–60	6.0–20	0.06–0.08	6.1–7.3	<2
[1] VdC:					
Valentine part	0–60	6.0–20	0.06–0.08	6.1–7.3	<2
Dunday part	0–12	2.0–6.0	0.10–0.12	6.1–7.3	<2
	12–60	2.0–20	0.09–0.11	6.1–7.8	<2
[1] VnD:					
Valentine part	0–60	6.0–20	0.06–0.08	6.1–7.3	<2
Tassel part	0–14	2.0–6.0	0.16–0.18	7.4–8.4	<2
	14–60				
Vetal:					
Vt	0–35	2.0–6.0	0.14–0.17	6.6–7.8	<2
	35–60	2.0–6.0	0.12–0.15	6.6–7.8	<2
Wanblee:					
[1] Wa:					
Wanblee part	0–2	0.6–2.0	0.19–0.22	6.1–7.4	<2
	2–8	<0.06	0.10–0.16	6.1–7.8	2–16
	8–20	0.2–0.6	0.13–0.17	7.9–9.0	4–16
	20–60			7.9–9.0	<4
Wortman part	0–9	0.6–2.0	0.18–0.22	6.1–7.8	<2
	9–19	<0.06	0.08–0.14	6.6–8.4	4–16
	19–30	0.2–0.6	0.13–0.15	7.9–9.0	2–8
	30–60				
Wann:					
Wb	0–20	2.0–6.0	0.16–0.18	6.6–7.8	<2
	20–60	2.0–6.0	0.08–0.15	7.4–8.4	<2
Westover:					
WeE	0–24	0.6–2.0	0.16–0.20	7.4–8.4	<2
	24–32	0.6–2.0	0.12–0.18	7.4–8.4	<2
	32–60	6.0–20	0.03–0.10	7.4–8.4	<2
Wewela:					
WfA	0–8	6.0–20	0.10–0.12	6.1–7.3	<2
	8–13	0.6–2.0	0.16–0.18	6.1–7.3	<2
	13–26	0.06–0.2	0.08–0.12	6.1–7.8	<2
	26–60	<0.06		6.6–8.4	<2
WgA, WgB	0–8	2.0–6.0	0.14–0.17	6.1–7.3	<2
	8–13	0.6–2.0	0.16–0.18	6.1–7.3	<2
	13–26	0.06–0.2	0.08–0.12	6.1–7.8	<2
	26–60	<0.06		6.6–8.4	<2
Whitelake:					
Wh	0–14	0.6–2.0	0.14–0.17	5.6–7.8	<2
	14–24	0.06–0.2	0.06–0.12	>7.4	4–16
	24–60	0.06–20	0.06–0.20	>7.4	2–8
[1] Wk:					
Whitelake part	0–14	0.6–2.0	0.14–0.17	5.6–7.8	<2
	14–24	0.06–0.2	0.06–0.12	>7.4	4–16
	24–60	0.06–20	0.06–0.20	>7.4	2–8

properties of soils—Continued

Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
	Uncoated steel	Concrete	K	T	
Low	Moderate	Low	0.24	1	8
Low	Low	Low	0.15	5	1
Low	Low	Low	0.15	5	1
Low Low	Low Low	Low Low	0.17 0.17	5	2
Low	Low	Low	0.15	5	1
Low	Moderate	Low	0.24	2	8
Low Low	Moderate Moderate	Low Low	0.20 0.20	5	3
Low High High Moderate	Moderate High High High	Low Moderate Moderate Moderate	0.32 0.32 0.32	1	8
Low High Moderate	Low High High	Low Moderate Moderate	0.32 0.32 0.32	3	6
Low Low	Moderate High	Low Low	0.20 0.20	5	3
Low Low Low	Moderate Moderate Moderate	Low Low Low	0.28 0.20 0.10	4–3	8
Low Moderate High High	Low Moderate High High	Low Low Moderate Moderate	0.17 0.28 0.28	4–3	2
Low Moderate High High	Low Moderate High High	Low Low Moderate Moderate	0.20 0.28 0.28	4–3	3
Low Low Low	Low High High	Low Moderate Moderate	0.20 0.20 0.20	4–3	3
Low Low Low	Low High High	Low Moderate Moderate	0.20 0.20 0.20	4–3	3

TABLE 12.—*Physical and chemical*

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity
	In	*In/hr*	*In/in*	*pH*	*Mmhos/cm*
Lute part	0–3	0.6–2.0	0.10–0.17	6.6–7.8	<2
	3–10	0.06–0.2	0.09–0.15	>8.5	4–16
	10–60	0.6–6.0	0.05–0.14	>8.5	4–16
Witten:					
Wn	0–9	0.06–0.2	0.10–0.14	6.6–7.8	<2
	9–26	0.06–0.2	0.10–0.14	6.6–7.8	<2
	26–60	0.06–0.2	0.08–0.12	7.4–8.4	2–4
Wortman:					
Wo	0–9	0.6–2.0	0.18–0.22	6.1–7.8	<2
	9–19	<0.06	0.08–0.14	6.6–8.4	4–16
	19–30	0.2–0.6	0.13–0.15	7.9–9.0	2–8
	30–60				

[1] This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

tions will function. Also, a seasonal high water table affects ease of excavation.

Depth to *bedrock* is shown for all soils that are underlain by bedrock at a depth of 5 or 6 feet or less. For many soils, limited ranges in depth to bedrock are a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and other observations during mapping. The kind of bedrock and its relative hardness as related to ease of excavation also are shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200 horsepower tractor, but hard bedrock generally requires blasting.

Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action is defined as freezing temperatures in the soil and movement of soil moisture into the freezing zone, which causes the formation of ice lenses. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly or sandy soils are the least susceptible.

Formation and classification of the soils

This section consists of two main parts. The first part describes the factors affecting soil formation in Tripp County. The second part explains the soil classification system currently used and places the soil series of this county in the system.

Factors of soil formation

Soil is produced by soil-forming processes acting on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time the factors of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that is formed and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil profile. It may be much or little, but some time is always required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil formation are unknown.

Parent material

Some of the soils in Tripp County formed in material weathered from the underlying geologic formations. Some formed in material transported and redeposited by wind and water.

The Pierre Formation, the oldest underlying bedrock, is exposed in the northern and southeastern parts of the county. It is marine shale that was deposited during the Cretaceous Period (*3*, *4*, *5*). It is dark gray to light gray and contains beds of bentonite and seams of limestone, iron, and manganese concretions. Boro, Boyd, Lakoma, Millboro, Okaton, Opal, Promise, and

properties of soils—Continued

Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
	Uncoated steel	Concrete	K	T	
Low	Moderate	Low			8
Low	High	Moderate			
Low	High	Moderate			
High	High	Moderate	0.37	5	4
High	High	Moderate	0.37		
High	High	Moderate	0.37		
Low	Low	Low	0.32	3	6
High	High	Moderate	0.32		
Moderate	High	Moderate	0.32		

Sansarc soils formed in clay weathered from the Pierre Formation.

Sediment of Tertiary age is near the surface in much of the southern part of the county. This material was deposited by freshwater streams after the Cretaceous. The Tertiary deposits in Tripp County are represented by the White River Group and the Ogallala Group.

The White River Group overlies the Pierre Formation and is the surface formation in the southwestern part of the county. It consists of clay, silt, and siltstone. Epping, Huggins, Kodaka, and Shena soils formed in silty material weathered from formations of the White River Group.

The Valentine and Ash Hollow Formations of the Ogallala Group are the surface formations across the southern part of the county. The Valentine Formation is mainly very light gray to green, weakly cemented, calcareous sandstone (*3, 5*). The Ash Hollow Formation consists of fine grained sandstone and siltstone. Among the soils formed in material weathered from these formations are those of the Canyon, Holt, Ronson, Rosebud, and Tassel series.

Loess and eolian sand are the two kinds of wind-deposited materials in the county. The loess consists of uniform silty material scattered across the northern and central parts of the county. It is the parent material of Lowry and Reliance soils. Extensive deposits of eolian sand are scattered across the southern part of the county and are the parent material of Anselmo, Doger, Dunday, Manter, Wewela, and Valentine soils.

Old alluvial deposits are on high terraces and terrace remnants scattered throughout the county. These stratified loamy to gravelly materials are the parent material of Canning, Murdo, Ree, and Schamber soils. Keya, Onita, Vetal, and Witten soils formed in local alluvium washed in from adjacent slopes. Bankard, Haverson, Inavale, and Munjor soils formed in alluvium recently deposited along streams.

Climate

Tripp County has a subhumid climate of cold winters and hot summers. Under such a climate, the weathering of bedrock and the forming of soils are slow processes. Because the climate is relatively uniform throughout the county, differences in the soils are not due to climate alone, but also to the effects of climate as modified by the other factors of soil formation. More detailed information on the climate of Tripp County is given in the section "General nature of the county."

Plant and animal life

Plants and animals, including insects, earthworms, bacteria, and fungi, are important in soil formation. Among the changes they cause are gains in organic matter, gains or losses in plant nutrients, and changes in soil structure and porosity.

The soils in Tripp County formed under a cover of grasses, which accounts for the moderate to high content of organic matter in the upper horizons of some soils. Native trees on bottom land grow mainly on sites with more favorable moisture conditions. These trees had little influence on the soils.

The influence of animal life on the soils is limited by the subhumid climate. Earthworms are active in friable and generally moist soils, such as Bridgeport, Keya, and Onita soils; but they are not active in sandy soils, such as Dunday and Valentine soils. Burrowing animals, such as gophers and prairie dogs, have mixed the horizons in some soils.

Relief

Relief affects soil formation through its effect on drainage and runoff. The Canyon, Epping, Okaton, and Sansarc soils are examples of steep soils that lose much of the rainfall because of runoff. These soils form slowly because little moisture enters the soil and

TABLE 13.—*Soil and*

[Absence of an entry indicates the feature is not a concern. See text for descriptions of symbols and

Soil name and map symbol	Hydrologic group	Flooding		
		Frequency	Duration	Months
Anselmo: AaB2, AbB, AbC, AbD	B	None		
[1] AhC: Anselmo part	B	None		
Holt part	B	None		
[1] AtD: Anselmo part	B	None		
Tassel part	D	None		
[1] AvA: Anselmo part	B	None		
Vetal part	B	None		
Bankard: [1] Ba	A	Frequent	Brief	Mar-June
Boro: [1] BmC: Boro part	D	None		
Millboro part	D	None		
Boyd: BnC	D	None		
[1] BOD: Boyd part	D	None		
Okaton part	D	None		
Bridgeport: Bp, Bt	B	Common	Very brief	Apr-Sept
Canning: CaB	B	None		
[1] CbD: Canning part	B	None		
Murdo part	B	None		
Carter: Cc	D	Rare		
Cass: Cd	B	Rare to occasional	Brief	Mar-June
Chappell: ChA	B	None		
[1] CnC: Chappell part	B	None		
Dix part	A	None		
Dix: DaA, [1] DbD	A	None		
Doger: DgB	A	None		

water features

such terms as "rare," "brief," and "perched." The symbol < means less than; > means greater than]

High water table			Bedrock		Potential frost action
Depth	Kind	Months	Depth	Hardness	
Ft			*In*		
>6.0			>60		Moderate.
>6.0			>60		Moderate.
>6.0			20–40	Rippable	Moderate.
>6.0			>60		Moderate.
>6.0			10–20	Rippable	Low.
>6.0			>60		Moderate.
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			20–40	Rippable	Low.
>6.0			20–40	Rippable	Low.
>6.0			8–20	Rippable	Low.
>6.0			>60		Moderate.
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			>60		Moderate.
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			>60		Low.

TABLE 13.—*Soil and*

Soil name and map symbol	Hydrologic group	Flooding		
		Frequency	Duration	Months
[1] DmA:				
Doger part	A	None		
Elsmere part	A	Rare		
Dunday:				
DnC2	A	None		
[1] DuC:				
Dunday part	A	None		
Doger part	A	None		
Elsmere:				
Em	A	Rare		
Epping:				
EpE	D	None		
Erd:				
Er	D	Rare		
[1] Es:				
Erd part	D	Rare		
Hurley part	D	None		
Haverson:				
Ha	B	Rare to common	Very brief	Apr-Sept
Holt:				
[1] HbA:				
Holt part	B	None		
Anselmo part	B	None		
Huggins:				
HgA	C	None		
[1] HkB:				
Huggins part	C	None		
Kadoka part	B	None		
Hurley:				
Hr	D	None		
Inavale:				
Ia, [1] Ic	A	Rare to occasional	Very brief	Jan-July
Kadoka:				
KaA	B	None		
[1] KbD:				
Kadoka part	B	None		
Epping part	D	None		
Keya:				
Ke	B	None to common	Very brief	Oct-June
Kolls:				
Ko	D	Common	Very long	Sept-June
Lakoma:				
[1] LkC:				
Lakoma part	D	None		

water features—Continued

High water table			Bedrock		Potential frost action
Depth	Kind	Months	Depth	Hardness	
Ft			*In*		
>6.0			>60		Low.
2.0–6.0	Apparent	May-Nov	>60		Moderate.
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			>60		Low.
2.0–6.0	Apparent	May-Nov	>60		Moderate.
>6.0			10–20	Rippable	Low.
2.0–5.0	Apparent	Apr-June	>60		Moderate.
2.0–5.0	Apparent	Apr-June	>60		Moderate.
>6.0			20–60	Rippable	Low.
>6.0			>60		Low.
>6.0			20–40	Rippable	Moderate.
>6.0			>60		Moderate.
>6.0			20–30	Hard	Low.
>6.0			20–30	Hard	Low.
>6.0			20–40	Rippable	Moderate.
>6.0			20–60	Rippable	Low.
>6.0			>60		Low.
>6.0			20–40	Rippable	Moderate.
>6.0			20–40	Rippable	Moderate.
>6.0			10–20	Rippable	Low.
>6.0			>60		Moderate.
>6.0			>60		Moderate.
>6.0			20–40	Rippable	Low.

TABLE 13.—*Soil and*

Soil name and map symbol	Hydrologic group	Flooding		
		Frequency	Duration	Months
Millboro part	D	None		
[1] LoD:				
Lakoma part	D	None		
Okaton part	D	None		
Lowry:				
LwA	B	None		
Manter:				
MaA, MaB	B	None		
[1] MfE:				
Manter part	B	None		
Anselmo part	B	None		
Marsh:				
Mh.				
Millboro:				
MoA, MoB, MoC	D	None		
Mosher:				
Mr	D	Rare		
[1] Ms:				
Mosher part	D	Rare		
Jarauld part	D	None		
Munjor:				
Mu	B	Common	Very brief	Apr-Sept
Okaton:				
[1] OAF	D	None		
[1] OBE:				
Okaton part	D	None		
Lakoma part	D	None		
[1] OcF:				
Okaton part	D	None		
Rock outcrop part.				
Onita:				
On	C	None to common	Very brief	Oct-June
[1] Oo:				
Onita part	C	None to common	Very brief	Oct-June
Mosher part	D	Rare		
Opal:				
OpC	D	None		
[1] OsE:				
Opal part	D	None		
Sansarc part	D	None		
Orwet:				
Ow	A	Rare		

water features—Continued

High water table			Bedrock		Potential frost action
Depth	Kind	Months	Depth	Hardness	
Ft			*In*		
>6.0			>60		Low.
>6.0			20–40	Rippable	Low.
>6.0			8–20	Rippable	Low.
>6.0			>60		Moderate.
>6.0			>60		Moderate.
>6.0			>60		Moderate.
>6.0			>60		Moderate.
>6.0			>60		Low.
3.0–6.0	Perched	Oct-June	>60		Moderate.
3.0–6.0	Perched	Oct-June	>60		Moderate.
>6.0			>60		Low.
>6.0			>60		Moderate.
>6.0			8–20	Rippable	Low.
>6.0			8–20	Rippable	Low.
>6.0			20–40	Rippable	Low.
>6.0			8–20	Rippable	Low.
4.0–6.0	Perched	Oct-June	>60		Low.
4.0–6.0	Perched	Oct-June	>60		Low.
3.0–6.0	Perched	Oct-June	>60		Moderate.
>6.0			20–40	Rippable	Low.
>6.0			20–40	Rippable	Low.
>6.0			4–20	Rippable	Low.
1.0–3.0	Apparent	Feb-Nov	>60		Moderate.

TABLE 13.—*Soil and*

Soil name and map symbol	Hydrologic group	Flooding		
		Frequency	Duration	Months
Promise: PrA, PrB, PrC	D	None		
PsA	D	Common	Very brief	Apr-Oct
PtA	D	Rare		
Ree: ReA, ReB, ReC, ReD	B	None		
Reliance: ReA, ReB, ReC, ReC2	C	None		
Ronson: RfA	B	None		
[1] RoB:				
Ronson part	B	None		
Tassel part	D	None		
Rosebud: RsB	B	None		
[1] RuC:				
Rosebud part	B	None		
Canyon part	D	None		
[1] RuD:				
Rosebud part	B	None		
Canyon part	D	None		
Sansarc:				
[1] SAE:				
Sansarc part	D	None		
Opal part	D	None		
[1] ScF:				
Sansarc part	D	None		
Shale outcrop part.				
Schamber:				
[1] ShE:				
Schamber part	A	None		
Murdo part	B	None		
Scott: So	D	Common	Long to very long	Mar-Aug
Shena: SsB	C	None		
Swanboy: Sw	D	None		
Tassel: TaE	D	None		
[1] TrF:				
Tassel part	D	None		
Rock outcrop part.				

water features—Continued

High water table			Bedrock		Potential frost action
Depth	Kind	Months	Depth	Hardness	
Ft			*In*		
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			>60		Moderate.
>6.0			>60		Low.
>6.0			20–40	Rippable	Moderate.
>6.0			20–40	Rippable	Moderate.
>6.0			10–20	Rippable	Low.
>6.0			20–40	Rippable	Moderate.
>6.0			20–40	Rippable	Moderate.
>6.0			6–20	Rippable	Low.
>6.0			20–40	Rippable	Moderate.
>6.0			6–20	Rippable	Low.
>6.0			4–20	Rippable	Low.
>6.0			20–40	Rippable	Low.
>6.0			4–20	Rippable	Low.
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			>60		High.
>6.0			<20	Rippable	Low.
>6.0			>60		Low.
>6.0			10–20	Rippable	Low.
>6.0			10–20	Rippable	Low.

TABLE 13.—*Soil and*

Soil name and map symbol	Hydrologic group	Flooding		
		Frequency	Duration	Months
Valentine:				
VaD	A	None		
[1] VdC:				
Valentine part	A	None		
Dunday part	A	None		
[1] VnD:				
Valentine part	A	None		
Tassel part	D	None		
Vetal:				
Vt	B	None		
Wanblee:				
[1] Wa:				
Wanblee part	D	None		
Wortman part	D	None		
Wann:				
Wb	B	Occasional	Brief	Mar-Nov
Westover:				
WeE	B	None		
Wewela:				
WfA, WgA, WgB	B	None		
Whitelake:				
Wh	B	None		
[1] Wk:				
Whitelake part	B	None		
Lute part	D	None		
Witten:				
Wn	D	Common	Very brief	Apr-June
Wortman:				
Wo	D	None		

[1] This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

natural erosion is active. Because runoff is less, soil formation is deeper and horizons are more distinct in gently sloping soils such as Millboro, Ree, and Reliance soils. Soil formation generally is deepest in nearly level soils, especially if they are in positions that receive extra moisture as runoff from adjacent soils. Keya, Onita, and Witten soils formed in these positions.

Time

The length of time that soil material has been exposed to the other factors of soil formation is reflected in the kinds of soil in the survey area. Some landscapes in Tripp County have been stable for relatively long periods. The soils on these older landscapes are leached of lime to depths of more than 16 inches and have well defined horizons. Ree and Reliance soils are examples. Haverson and Munjor soils, on the other hand, formed in recent alluvium and have little or no horizon development.

Classification

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to the latest literature available (*10*).

The system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the bases for classification are the different soil properties that can be observed in the

water features—Continued

High water table			Bedrock		Potential frost action
Depth	Kind	Months	Depth	Hardness	
Ft			*In*		
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			>60		Low.
>6.0			10–20	Rippable	Low.
>6.0			>60		Low.
>6.0			20–40	Rippable	Low.
>6.0			20–40	Rippable	Low.
2.2–6.0	Apparent	Apr-June	>60		High.
>6.0			>60		Moderate.
>6.0			20–40	Rippable	Moderate.
2.0–6.0	Perched	Apr-July	>60		High.
2.0–6.0	Perched	Apr-July	>60		High.
1.0–5.0	Perched	Apr-July	>60		High.
>6.0			>60		Moderate.
>6.0			20–40	Rippable	Low.

field or those that can be inferred either from the other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 14 the soils of the survey area are classified according to the system. Classes of the system are briefly discussed in the following paragraphs.

ORDER. Ten soil orders are recognized. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol.* An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and that are important to plant growth or that were selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu,* meaning water, plus *ent,* from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. The name of a great group ends with the name of a suborder. A prefix added to the name suggests something about the properties of the soil. An example is Haplaquents (*Hapl,* meaning simple horizons, plus *aquent,* the suborder of Entisols that have an aquic moisture regime).

SUBGROUP. Each great group is divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive

TABLE 14.—*Classification of the soils*

[An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics of this taxadjunct that are outside the range of the series]

Soil name	Family or higher taxonomic class
Anselmo	Coarse-loamy, mixed, mesic Typic Haplustolls
Bankard	Sandy, mixed, mesic Ustic Torrifluvents
Boro	Fine, montmorillonitic, mesic Vertic Ustochrepts
Boyd	Fine, montmorillonitic, mesic Vertic Haplustolls
*Bridgeport	Fine-silty, mixed, mesic Fluventic Haplustolls
Canning	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Argiustolls
Canyon	Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents
Carter	Very-fine, montmorillonitic, mesic Vertic Paleustolls
Cass	Coarse-loamy, mixed, mesic Fluventic Haplustolls
*Chappell	Coarse-loamy, mixed, mesic Aridic Haplustolls
*Dix	Sandy-skeletal, mixed, mesic Torriorthentic Haplustolls
Doger	Sandy, mixed, mesic Entic Haplustolls
Dunday	Sandy, mixed, mesic Entic Haplustolls
Elsmere	Sandy, mixed, mesic Aquic Haplustolls
*Epping	Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents
Erd	Fine, montmorillonitic (calcareous), mesic Vertic Haplaquolls
*Haverson	Fine-loamy, mixed (calcareous), mesic Ustic Torrifluvents
Holt	Coarse-loamy, mixed, mesic Typic Argiustolls
Huggins	Fine, montmorillonitic, mesic Aridic Argiustolls
Hurley	Very-fine, montmorillonitic, mesic Leptic Natrustolls
Inavale	Sandy, mixed, mesic Typic Ustifluvents
*Jerauld	Fine, montmorillonitic, mesic Leptic Natrustolls
Kadoka	Fine-silty, mixed, mesic Aridic Argiustolls
Keya	Fine-loamy, mixed, mesic Pachic Argiustolls
Kolls	Very-fine, montmorillonitic (calcareous), mesic Vertic Haplaquolls
Lakoma	Fine, montmorillonitic, mesic Typic Ustochrepts
Lowry	Coarse-silty, mixed, mesic Typic Haplustolls
Lute	Fine-loamy, mixed, mesic Typic Natraquolls
*Manter	Coarse-loamy, mixed, mesic Aridic Argiustolls
Millboro	Fine, montmorillonitic, mesic Vertic Argiustolls
Mosher	Fine, montmorillonitic, mesic Typic Natrustolls
Munjor	Coarse-loamy, mixed (calcareous), mesic Typic Ustifluvents
*Murdo	Loamy-skeletal, mixed, mesic Aridic Argiustolls
Okaton	Clayey, montmorillonitic (calcareous), mesic, shallow, Typic Ustorthents
Onita	Fine, montmorillonitic, mesic Pachic Argiustolls
Opal	Very-fine, montmorillonitic, mesic Vertic Haplustolls
Orwet	Sandy, mesic Typic Calciaquolls
Promise	Very-fine, montmorillonitic, mesic Vertic Haplustolls
Ree	Fine-loamy, mixed, mesic Typic Argiustolls
Reliance	Fine, montmorillonitic, mesic Typic Argiustolls
Ronson	Coarse-loamy, mixed, mesic Entic Haplustolls
Rosebud	Fine-loamy, mixed, mesic Aridic Argiustolls
Sansarc	Clayey, montmorillonitic (calcareous), mesic, shallow Typic Ustorthents
Schamber	Sandy-skeletal, mixed, mesic Ustic Torriorthents
*Scott	Fine, montmorillonitic, mesic Typic Argialbolls
Shena	Clayey, mixed, mesic, shallow Aridic Argiustolls
Swanboy	Very-fine, montmorillonitic, mesic Ustertic Camborthids
Tassel	Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents
Valentine	Mixed, mesic Typic Ustipsamments
Vetal	Coarse-loamy, mixed, mesic Pachic Haplustolls
Wanblee	Fine, montmorillonitic, mesic Ustollic Natrargids
*Wann	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls
Westover	Coarse-loamy, mixed (calcareous), mesic Typic Ustorthents
Wewela	Fine-loamy, mixed, mesic Typic Argiustolls
Whitelake	Fine-loamy, mixed, mesic Typic Natrustolls
Witten	Fine, montmorillonitic, mesic Vertic Argiustolls
Wortman	Fine, montmorillonitic, mesic Typic Natrustolls

subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades that have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. The names of subgroups are derived by placing one or more adjectives before the name of the great group. The adjective *Typic* is used for the subgroup that is thought to typify the great group. An example is Typic Haplaquents.

FAMILY. Families are established with a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil

penetrable by roots, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is fine-loamy, mixed, nonacid, mesic Typic Haplaquents.

SERIES. The series consists of a group of soils that formed from a particular kind of parent material and have horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

General nature of the county

This section describes some of the natural and cultural features of Tripp County that affect the use and management of the kinds of soils in this survey. Natural features are relief, water, and climate. Natural vegetation is described under the sections, "Range" and "Native woods and windbreaks." Cultural features include population, transportation, business services, schools, recreation, and trends in soil use.

Relief

Elevation ranges from less than 1,500 feet along the White River in the northeastern part of the county to more than 2,400 feet in the southwestern part of the county.

Most of the northern half of the county is a shale plain at elevations of 1,800 to 2,000 feet. The long, smooth slopes are nearly level to strongly sloping, and differences in elevation are mostly 10 to 50 feet except for a few prominent buttes that rise to elevations of about 2,200 feet. Hilly to very steep relief is on the sides of buttes and in the breaks of the White River and its tributaries. Elevation differences in these areas are as much as 150 feet within a distance of 1 mile.

The southern part of the county is an upland plain at elevations of 2,200 to 2,400 feet. Slopes are mostly nearly level to strongly sloping, and local elevation differences range from a few feet to as much as 50 feet. Steeper slopes are in the rough, broken areas along the Keya Paha River and Turtle Butte. Slopes are undulating to rolling in areas of sandy soils.

Water

Shallow wells ranging in depth from a few feet to as much as 200 feet are a source of domestic and livestock water in much of the southern part of the county. The water is hard but generally is of good quality and is potable. The northern part of the county is underlain by clay shales and generally lacks shallow ground water except on some of the high terraces, along some of the larger drainageways, and on the White River bottoms. The quality of the water is generally good on the high terraces, but elsewhere the shallow ground water is limited in quantity and generally is of poor quality. Deep artesian wells can be obtained in the northern part of the county where the surface elevation is 1,800 feet or less.

Surface water includes the White River, the Keya Paha River and some of its spring-fed tributaries, Dog Ear Lake, and small impoundments on drainageways. Much of the northern part of the county depends on small surface-water reservoirs for livestock water.

Climate

Tripp County has cool winters and very hot summers. One third of the winter precipitation is snow. The growing season precipitation is 77 percent of the total annual precipitation.

This climatic summary is based on data recorded at Winner, in the central part of Tripp County, starting in 1931. Elevation at Winner is 1,965 feet above mean sea level. The topography of the county has no significant effect on the climate. There are no lakes or other large water areas to affect the climate.

The range in temperature from summer to winter is large, and at times the daily range is great. Temperatures in summer are above 90° F on an average of 45 days per year. Temperatures above 100° occur, on an average, 9 days per year. The warmest month between 1941 and 1970 was July 1955, when the maximum temperature averaged 94.9 and the minimum averaged 65.1°. In winter the minimum temperature is 20° below zero or lower about once a year. The coldest month between 1941 and 1970 was January 1949, when the maximum temperature averaged 25.7° and the minimum averaged 5.6°. The minimum temperature is below 0° about 20 days per year.

Table 15 gives the probabilities of specified temperatures occurring after certain dates in spring and before certain dates in fall. It shows that there is a 50 percent chance that a temperature of 32° or lower will occur after May 7 in spring and before October 4 in fall. Using these two average dates, the average growing season is 150 days.

Other data on temperature and precipitation are given by month in table 16. The smallest annual precipitation was 13.78 inches in 1943. The largest annual precipitation was 40.67 inches in 1962. The growing season precipitation ranged from 34.22 inches in 1962 to 6.82 inches in 1970. Most of the rainfall during the growing season comes from thunderstorms of widely differing intensities. About once a year, 1 inch of rain falls in an hour; once in 10 years 2 inches falls in an hour. Two inches falls in 24 hours once a year; and 3 inches falls in 24 hours once in 5 years.

The average annual snowfall at Winner is 35.2 inches. Snow cover protects fields and pastures, but a heavy snow cover generally delays farm operations in spring. The smallest amount of snow, 12.5 inches, fell during the winter of 1946–1947. The most snow, 69.6 inches, fell during the winter of 1956–1957. The period with 1 inch or more of snow on the ground averaged 52 days and has ranged from 19 to 115 days. The greatest amount of snowfall in one day, 18 inches, was on February 17, 1962. Strong winter winds cause the snow cover to be greater in sheltered places and less on open fields that have little or no plant cover or crop residue.

In an average year sunshine can be expected about 60 percent of the time. The greatest amount is in July

TABLE 15.—*Probabilities of specified temperatures in spring and in fall*

[Data from records kept at Winner, South Dakota, 1941–1970]

Probability	Dates for given probability and temperature				
	16° F or lower	20° F or lower	24° F or lower	28° F or lower	32° F or lower
After the date in spring:					
90 percent	Mar. 11	Mar. 18	Mar. 22	Apr. 1	Apr. 17
70 percent	Mar. 18	Mar. 26	Apr. 1	Apr. 10	Apr. 25
50 percent	Apr. 1	Apr. 8	Apr. 16	Apr. 25	May 7
30 percent	Apr. 14	Apr. 21	Apr. 29	May 10	May 20
10 percent	Apr. 21	Apr. 29	May 10	May 19	May 28
Before the date in fall:					
10 percent	Oct. 23	Oct. 14	Oct. 4	Sept. 23	Sept. 18
30 percent	Oct. 30	Oct. 20	Oct. 11	Oct. 1	Sept. 24
60 percent	Nov. 10	Oct. 31	Oct. 23	Oct. 13	Oct. 4
70 percent	Nov. 21	Nov. 11	Nov. 5	Oct. 25	Oct. 14
90 percent	Nov. 28	Nov. 17	Nov. 12	Nov. 1	Oct. 21

TABLE 16.—*Temperature and precipitation*

[All data recorded at Winner, South Dakota, 1941–1970]

Month	Temperature				Precipitation				
	Average daily high	Average daily low	2 years in 10 will have—		Average total	1 year in 10 will have—		Average number of days with snowfall of 1 inch or more	Average number of days with snow depth of 1 inch or more
			Average daily high equal to or higher than—	Average daily low equal to or lower than—		Less than—	More than—		
	°F	°F	°F	°F	In	In	In		
January	32.8	9.8	40.3	1.2	0.47	0.07	1.02	2	15
February	37.3	13.6	45.2	5.2	.61	.08	1.31	2	13
March	45.9	22.0	52.8	15.7	1.20	.40	2.19	3	9
April	61.6	34.9	66.9	30.5	2.37	.63	4.58	1	1
May	72.9	46.3	78.0	41.8	3.06	.95	5.71	0	0
June	82.2	56.4	87.2	52.8	3.74	1.69	6.17	0	0
July	90.9	62.7	95.6	59.5	2.43	.84	4.40	0	0
August	88.9	60.9	92.5	58.0	2.51	.92	4.45	0	0
September	77.6	49.7	85.2	42.4	1.65	.28	3.48	0	0
October	66.5	39.0	71.5	34.3	1.21	.08	2.67	0	0
November	48.4	25.0	53.7	20.6	.66	.05	1.57	2	4
December	37.0	15.3	42.6	9.3	.47	.08	1.00	2	10
Year	61.9	36.4	64.1	34.5	20.38	14.54	26.84	12	52

and August when sunshine can be expected 75 percent of the time.

Windspeed averages 11 miles per hour in summer, when prevailing wind is from the southeast. It averages 14 miles per hour in winter, when prevailing wind is from the northwest. Windspeed of more than 50 miles per hour can occur with a storm throughout the year but is most likely during a summer thunderstorm. Thunderstorms occur on an average of 40 to 45 days per year. Hail often accompanies thunderstorms and falls in some part of this county 3 times a year, on the average. Hail is most likely to occur in May or June.

The relative humidity differs widely from early morning to afternoon and from day to day. The annual average is 80 percent in the morning and 50 percent in the afternoon.

The potential water loss from soil and crops is indicated by the loss from an evaporation pan. The average annual evaporation from a "class A pan" in Tripp County is about 55 inches. An average of about

43 inches evaporates during the growing season. The average annual rate of evaporation from small lakes is about 39 inches; and the water loss from soil and crops is generally less, depending upon the available soil moisture.

Cultural features

Tripp County was created in 1873 by an act of the Dakota Territorial Legislature. It was a part of the Rosebud Indian Reservation and was unorganized until 1909, when it was opened for settlement.

The county was rapidly settled. By 1910 it had a population of 8,323. The population reached 12,712 in 1930 but has steadily declined since then. The population in 1970 was 8,171. Winner, the county seat, is the largest town. Colome and Witten are other towns. Carter, Clearfield, Hamill, Ideal, Keya Paha, and Wewela are rural settlements.

U.S. highways 18 and 183 and State Highway 44 are the main routes for motor transportation. Hard surfaced and gravelly secondary roads connect the rural areas with the main highways. One railroad line, from Norfolk, Nebraska, to Winner, serves the county.

Much of the livestock is marketed locally at auction barns in Winner and in adjacent counties. Some are shipped to central markets at Omaha, Sioux City, and Sioux Falls. Grain elevators at Colome and Winner provide market outlets for wheat and other grains. A cheese factory at Mission in adjacent Todd County provides a market for milk producers. Winner is the business center of the county and is the main location of retailers of farm equipment, hardware, and other farm supplies.

School facilities consist of elementary and high schools in Colome and Winner. Because of school reorganization, only a few rural schools from the many that were once scattered throughout the county still operate.

Hunting and fishing are the main recreational activities in the county. Small stockwater ponds and several larger reservoirs provide fisheries for bass and panfish. Pheasant and deer are scattered throughout the county and sharptail grouse are in the northern and southwestern parts. Small herds of antelope are in the extreme northern part of the county.

Trends in soil use

Dryfarming and cattle ranching are the main farm enterprises in the county. The opening of the county for homesteading in 1909 brought an influx of settlers. In 1910, the 2,444 farms were an average of 173 acres in size. Since 1925 the number of farms has steadily decreased with a corresponding increase in average size. According to the census in 1973 there were 880 farms having an average size of 1,165 acres.

About 65 percent of the farm income is derived from the sale of livestock and livestock products, and about 35 percent is from sale of crops.

A gradual increase in livestock numbers has accompanied the increase in farm size. On January 1, 1974, there were 131,000 cattle on farms and ranches, of which 3,100 were held for dairy purposes (*6*). There also were 54,000 hogs and 11,900 sheep. Several ranchers also raise quarter horses for sale and for show.

The major crops in the county are alfalfa, wheat, sorghum, oats, and corn. In 1973, 94,000 acres of alfalfa hay was harvested; 50,870 acres of wheat; 47,000 acres of grain sorghum; 38,000 acres of oats; 33,500 acres of corn; 11,800 acres of barley; and 2,000 acres of rye. Additional acreages of sorghum, corn, and oats were harvested for silage and hay. Alfalfa seed was harvested from 3,400 acres in 1972 (*6*) and was a significant source of income. The trend during the past 40 years has been toward less emphasis on cash crops and a greater use of feed and forage crops for livestock.

Additional information on the history of cropping and livestock raising can be obtained from the annual reports of the South Dakota Crop and Livestock Reporting Service.

References

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-66T. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Collins, S. G. 1957. Geology of the Wewela Quadrangle, South Dakota. S. Dak. Geol. Surv., map and text.

(4) Schoon, R. A. 1957. Geology of the Witten Quadrangle, South Dakota. S. Dak. Geol. Surv., map and text.

(5) Schoon, R. A., and W. D. Sevon. 1957. Geology of the Keyapaha Quadrangle, South Dakota. S. Dak. Geol. Surv., map and text.

(6) South Dakota Crop and Livestock Reporting Service. 1974. South Dakota agricultural statistics, 68 pp., illus.

(7) United States Bureau of the Census. 1971. U.S. census of population: 1970. South Dakota.

(8) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173–188 issued May 1962]

(9) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.

(10) United States Department of Agriculture. 1975. Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys. U.S. Dep. Agric. Handb. 436, 754 pp., illus.

Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

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—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz)

visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

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.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Complex, slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Compressible. Excessive decrease in volume of soft soil under load.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or that are parallel to terrace grade.

Contour stripcropping (or contour farming). 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.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue use. Using crop residue to improve soil tilth and to reduce soil blowing.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Emergency tillage. Cultivation by listing, ridging, duckfooting, chiseling, pitting basin listing, or other means to roughen the soil surface for temporary control of wind erosion.

Erosion. The wearing away of the land surface by running 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 the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake. 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.

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming 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.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

Cr horizon.—A mineral horizon or layer of weathered bedrock or partially consolidated soft bedrock such as sandstone, siltstone, or shale having bulk density or consolidation such that roots cannot enter.

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 A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. Inadequate strength for supporting loads.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—few, common, and many; size—fine, medium, and coarse; and contrast—faint, distinct, and prominent. The size measurements are of the diameter along the greatest dimension. Fine indicates less than 5 millimeters (about 0.2 inch); medium, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and coarse, more than 15 millimeters (about 0.6 inch).

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

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.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are very slow (less than 0.06 inch), slow (0.06 to 0.20 inch), moderately slow (0.2 to 0.6 inch), moderate (0.6 to 2.0 inches), moderately rapid (2.0 to 6.0 inches), rapid (6.0 to 20 inches), and very rapid (more than 20 inches).

Piping. Moving water forms subsurface tunnels or pipelike cavities in the soil.

Reaction, soil. The degree of acidity or alkalinity of a soil, ex-

pressed 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 degree of acidity or alkalinity is expressed as—

	pH		pH
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called groundwater 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. The salinity classes used in this survey are as follows:

Class	*mmho/cm*
None	Less than 2.0
Low	2.0 to 4.0
Moderate	4.0 to 8.0
High	8.0 to 16.0
Very high	More than 16.0

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.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining 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 grained (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, to provide protection 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 crops.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Surface soil. 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."

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 it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally 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. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by 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, silt loam, 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. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Unstable fill. Risk of caving or sloughing in banks of fill material.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Wind stripcropping. Growing crops in strips that run crosswise to the general direction of prevailing wind and without strict adherence to the contour of the land.

GUIDE TO MAPPING UNITS

Absence of a capability unit or pasture group designation indicates that the mapping unit is not placed in a specified grouping, or that the individual soils of a mapping unit are designated separately. For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs.

Map symbol	Mapping unit	Described on page	Capability unit		Pasture group
			Symbol	Page	Letter
AaB2	Anselmo loamy fine sand, 0 to 9 percent slopes, eroded	13	VIe-6	77	H
AbB	Anselmo fine sandy loam, 3 to 6 percent slopes	13	IIIe-8	74	H
AbC	Anselmo fine sandy loam, 6 to 9 percent slopes	13	IVe-8	76	H
AbD	Anselmo fine sandy loam, 9 to 15 percent slopes	14	VIe-6	77	H
AhC	Anselmo-Holt fine sandy loams, 3 to 9 percent slopes	14	------	--	H
	Anselmo part	--	IIIe-8	74	---
	Holt part	--	IVe-8	76	---
AtD	Anselmo-Tassel fine sandy loams, 10 to 20 percent slopes	14	VIe-6	77	---
	Anselmo part	--	------	--	H
	Tassel part	--	------	--	---
AvA	Anselmo-Vetal fine sandy loams, 0 to 3 percent slopes	15	IIIe-7	74	H
Ba	Bankard complex	16	VIe-8	78	---
BmC	Boro-Millboro silty clays, 5 to 9 percent slopes	17	VIe-4	75	I
BnC	Boyd clay, 5 to 9 percent slopes	18	IVe-4	75	I
BOD	Boyd-Okaton association, 9 to 25 percent slopes	19	VIe-4	77	---
	Boyd part	--	------	--	I
	Okaton part	--	------	--	---
Bp	Bridgeport complex	19	IIc-1	73	K
Bt	Bridgeport complex, channeled	20	VIw-1	78	K
CaB	Canning loam, 2 to 5 percent slopes	21	IIIe-6	73	D
CbD	Canning-Murdo loams, 6 to 15 percent slopes	21	VIe-5	77	---
	Canning part	--	------	--	D
	Murdo part	--	------	--	---
Cc	Carter silty clay loam	22	IVs-2	77	C
Cd	Cass fine sandy loam	23	IIIe-7	74	H
ChA	Chappell fine sandy loam, 0 to 3 percent slopes	24	IIIe-9	74	D
CnC	Chappell-Dix fine sandy loams, 6 to 9 percent slopes	24	VIe-5	77	---
	Chappell part	--	------	--	D
	Dix part	--	------	--	---
DaA	Dix fine sandy loam, 0 to 3 percent slopes	25	VIs-4	78	---
DbD	Dix soils, 9 to 18 percent slopes	25	VIIs-4	79	---
DgB	Doger loamy fine sand, 0 to 6 percent slopes	26	IVe-9	76	H
DmA	Doger-Elsmere complex, 0 to 3 percent slopes	26	IVe-9	76	---
	Doger part	--	------	--	H
	Elsmere part	--	------	--	A
DnC2	Dunday loamy fine sand, 3 to 9 percent slopes, eroded	27	VIe-7	77	H
DuC	Dunday-Doger loamy fine sands, 3 to 9 percent slopes	27	------	--	H
	Dunday part	--	VIe-7	77	---
	Doger part	--	IVe-9	76	---
Em	Elsmere fine sandy loam	28	IVe-10	76	A
EpE	Epping soils, 12 to 25 percent slopes	29	VIe-11	78	---
Er	Erd clay	29	IIIw-3	74	I
Es	Erd-Hurley complex	30	------	--	---
	Erd part	--	IIIw-3	74	I
	Hurley part	--	VIs-1	78	---
Ha	Haverson soils	31	IIc-1	73	G
HbA	Holt-Anselmo fine sandy loams, 0 to 3 percent slopes	32	IIIe-9	74	H
HgA	Huggins silt loam, 0 to 3 percent slopes	32	IIIs-5	75	E
HkB	Huggins-Kadoka silt loams, 3 to 9 percent slopes	33	IIIe-12	74	---
	Huggins part	--	------	--	E
	Kadoka part	--	------	--	F
Hr	Hurley silt loam	33	VIs-1	78	---
Ia	Inavale loamy fine sand	34	IVe-9	76	H
Ic	Inavale complex, channeled	34	VIw-1	78	H

Map symbol	Mapping unit	Described on page	Capability unit		Pasture group
			Symbol	Page	Letter
KaA	Kadoka silt loam, 0 to 3 percent slopes	36	IIc-2	73	F
KbD	Kadoka-Epping silt loams, 6 to 12 percent slopes	36	------	--	---
	Kadoka part	--	IVe-1	75	F
	Epping part	--	VIe-11	78	---
Ke	Keya silt loam	37	IIc-3	73	K
Ko	Kolls clay	38	Vw-4	77	B
LkC	Lakoma-Millboro silty clays, 5 to 9 percent slopes	38	IVe-4	75	I
LoD	Lakoma-Okaton silty clays, 9 to 15 percent slopes	38	VIe-4	77	---
	Lakoma part	--	------	--	I
	Okaton part	--	------	--	---
LwA	Lowry silt loam, 0 to 4 percent slopes	39	IIe-1	72	F
MaA	Manter fine sandy loam, 0 to 3 percent slopes	41	IIIe-7	74	H
MaB	Manter fine sandy loam, 3 to 9 percent slopes	41	IIIe-8	74	H
MfE	Manter-Anselmo fine sandy loams, 15 to 30 percent slopes	41	VIe-6	77	---
Mh	Marsh	41	VIIIw-1	79	---
MoA	Millboro silty clay, 0 to 3 percent slopes	43	IIIs-3	75	I
MoB	Millboro silty clay, 3 to 6 percent slopes	43	IIIe-4	73	I
MoC	Millboro silty clay, 6 to 9 percent slopes	43	IVe-4	75	I
Mr	Mosher silt loam	44	IVs-2	77	C
Ms	Mosher-Jerauld silt loams	44	------	--	---
	Mosher part	--	IVs-2	77	C
	Jerauld part	--	VIs-1	78	---
Mu	Munjor fine sandy loam	45	IIIe-7	74	H
OAF	Okaton association, 25 to 40 percent slopes	46	VIIe-8	79	---
OBE	Okaton-Lakoma association, 15 to 40 percent slopes	46	VIIe-8	79	---
OcF	Okaton-Rock outcrop complex, 25 to 60 percent slopes	46	------	--	---
	Okaton part	--	VIIe-8	79	---
	Rock outcrop part	--	VIIIs-1	79	---
On	Onita silt loam	47	IIc-3	73	K
Oo	Onita-Mosher silt loams	48	------	--	---
	Onita part	--	IIc-3	73	K
	Mosher part	--	IVs-2	77	C
OpC	Opal clay, 3 to 9 percent slopes	48	IVe-4	75	I
OsE	Opal-Sansarc clays, 9 to 25 percent slopes	49	VIe-4	77	---
	Opal part	--	------	--	I
	Sansarc part	--	------	--	---
Ow	Orwet loam	49	IVw-1	76	A
PrA	Promise clay, 0 to 3 percent slopes	50	IIIs-3	75	I
PrB	Promise clay, 3 to 6 percent slopes	50	IIIe-4	73	I
PrC	Promise clay, 6 to 9 percent slopes	50	IVe-4	75	I
PsA	Promise clay, channeled, 0 to 2 percent slopes	50	VIw-1	78	I
PtA	Promise clay, loamy substratum, 0 to 2 percent slopes	51	IIIs-3	75	I
RaA	Ree loam, 0 to 3 percent slopes	51	IIc-2	73	F
RaB	Ree loam, 3 to 6 percent slopes	52	IIe-1	72	F
RaC	Ree loam, 6 to 9 percent slopes	52	IIIe-1	73	F
RaD	Ree loam, 9 to 15 percent slopes	52	IVe-1	75	F
ReA	Reliance silty clay loam, 0 to 3 percent slopes	53	IIc-2	73	F
ReB	Reliance silty clay loam, 3 to 6 percent slopes	53	IIe-1	72	F
ReC	Reliance silty clay loam, 6 to 9 percent slopes	53	IIIe-1	73	F
ReC2	Reliance silty clay loam, 6 to 9 percent slopes, eroded	54	IVe-1	75	F
RfA	Ronson fine sandy loam, 0 to 4 percent slopes	54	IIIe-9	74	H
RoB	Ronson-Tassel fine sandy loams, 0 to 6 percent slopes	55	------	--	---
	Ronson part	--	IIIe-9	74	H
	Tassel part	--	VIe-10	78	---
RsB	Rosebud loam, 3 to 6 percent slopes	55	IIe-1	72	F
RuC	Rosebud-Canyon loams, 6 to 9 percent slopes	55	------	--	---
	Rosebud part	--	IIIe-1	73	F
	Canyon part	--	VIe-11	78	---

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Pasture group
			Symbol	Page	Letter
RuD	Rosebud-Canyon loams, 9 to 15 percent slopes	56	------	--	---
	Rosebud part	--	IVe-1	75	F
	Canyon part	--	VIe-11	78	---
SAE	Sansarc-Opal association, 15 to 40 percent slopes	56	VIIe-8	79	---
ScF	Sansarc-Shale outcrop complex, 25 to 40 percent slopes	57	------	--	---
	Sansarc part	--	VIIe-8	79	---
	Shale outcrop part	--	VIIIs-2	79	---
ShE	Schamber-Murdo complex, 15 to 40 percent slopes	57	VIIs-4	79	---
So	Scott silt loam	59	IV_w-1	76	B
SsB	Shena silt loam, 0 to 9 percent slopes	59	VIe-11	78	---
Sw	Swanboy clay	60	VIs-5	78	---
TaE	Tassel fine sandy loam, 9 to 40 percent slopes	61	VIIe-4	79	---
TrF	Tassel-Rock outcrop complex, 15 to 40 percent slopes	61	------	--	---
	Tassel part	--	VIIe-4	79	---
	Rock outcrop part	--	VIIIs-1	79	---
VaD	Valentine fine sand, 6 to 15 percent slopes	62	VIe-7	77	---
VdC	Valentine-Dunday complex, 3 to 9 percent slopes	62	VIe-7	77	---
VnD	Valentine-Tassel complex, 6 to 15 percent slopes	63	VIe-7	77	---
Vt	Vetal fine sandy loam	64	IIIe-7	74	H
Wa	Wanblee-Wortman silt loams	64	------	--	---
	Wanblee part	--	VIs-1	78	---
	Wortman part	--	IVs-2	77	C
Wb	Wann fine sandy loam	65	IIIw-5	75	A
WeE	Westover loam, 9 to 25 percent slopes	66	VIe-3	77	---
WfA	Wewela loamy fine sand, 0 to 4 percent slopes	67	IVe-9	76	H
WgA	Wewela fine sandy loam, 0 to 3 percent slopes	67	IIIe-9	74	H
WgB	Wewela fine sandy loam, 3 to 6 percent slopes	67	IIIe-10	74	H
Wh	Whitelake fine sandy loam	68	IVe-13	76	H
Wk	Whitelake-Lute fine sandy loams	68	------	--	---
	Whitelake part	--	IVe-13	76	H
	Lute part	--	VIs-1	78	---
Wn	Witten silty clay	69	IIIs-3	75	I
Wo	Wortman silt loam	70	IVs-2	77	C

☆ U.S. GOVERNMENT PRINTING OFFICE: 1979-237-567/7

NRCS Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.