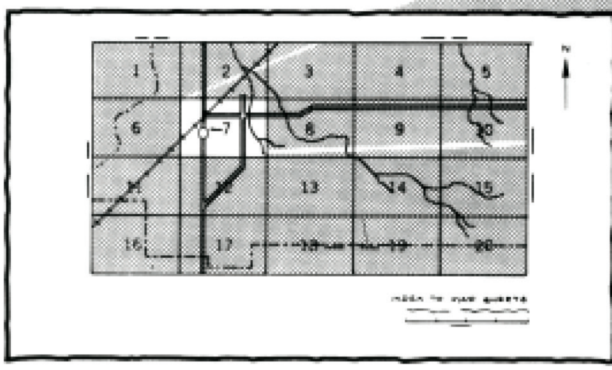
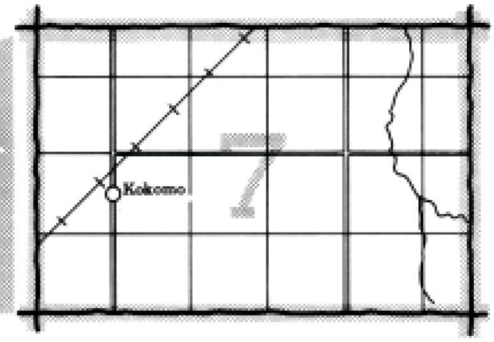
Soil Survey of
Perkins County, South Dakota

U.S. Department of Agriculture, Soil Conservation Service and Forest Service
in cooperation with the South Dakota Agricultural Experiment Station

HOW TO USE

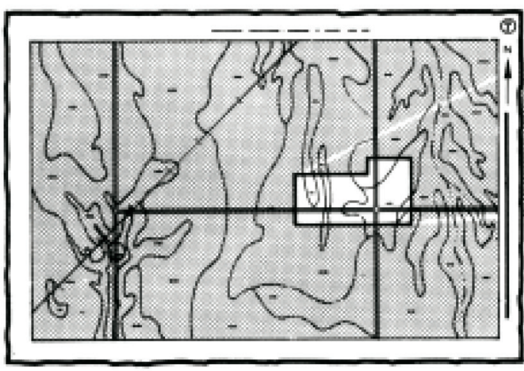
1. Locate your area of interest on the ''Index to Map Sheets''

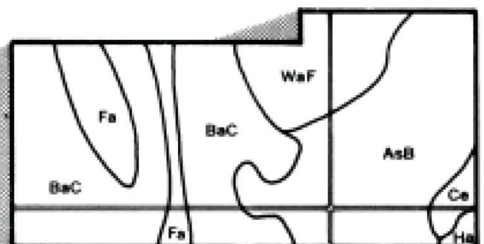




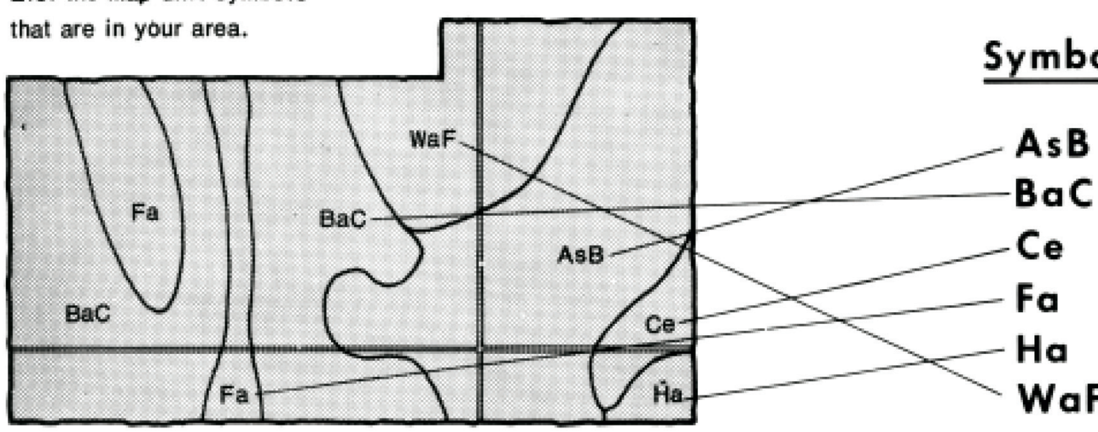
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



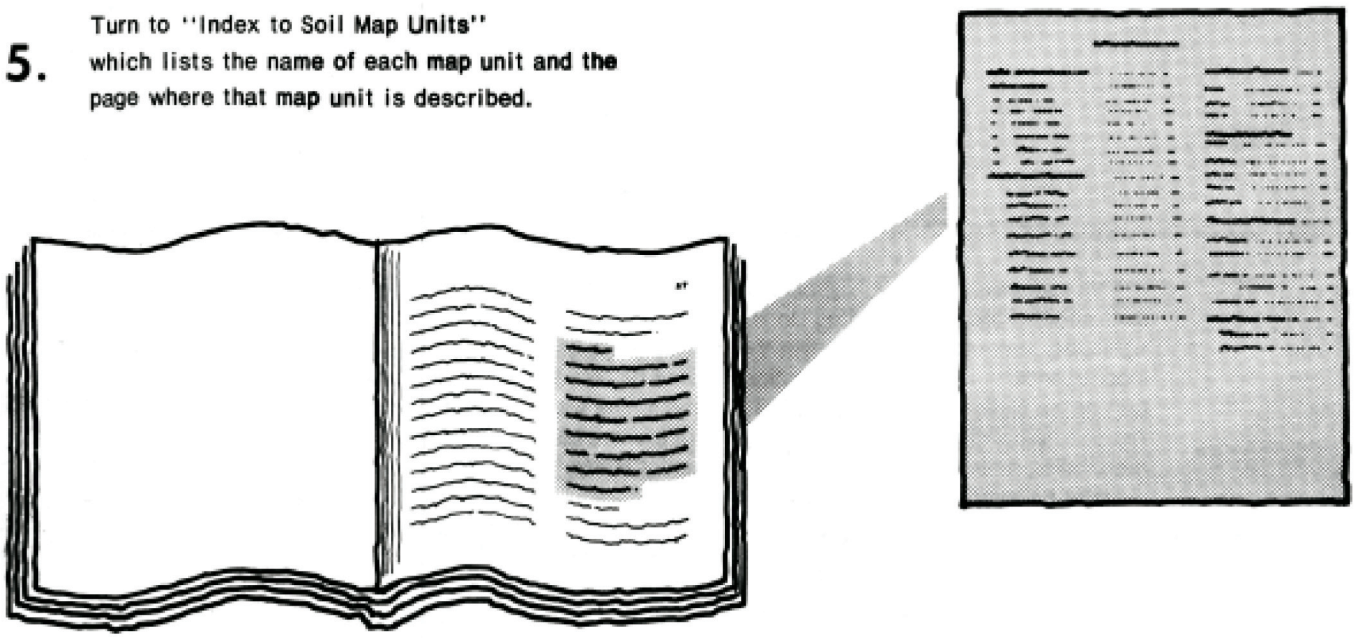


4. List the map unit symbols that are in your area.

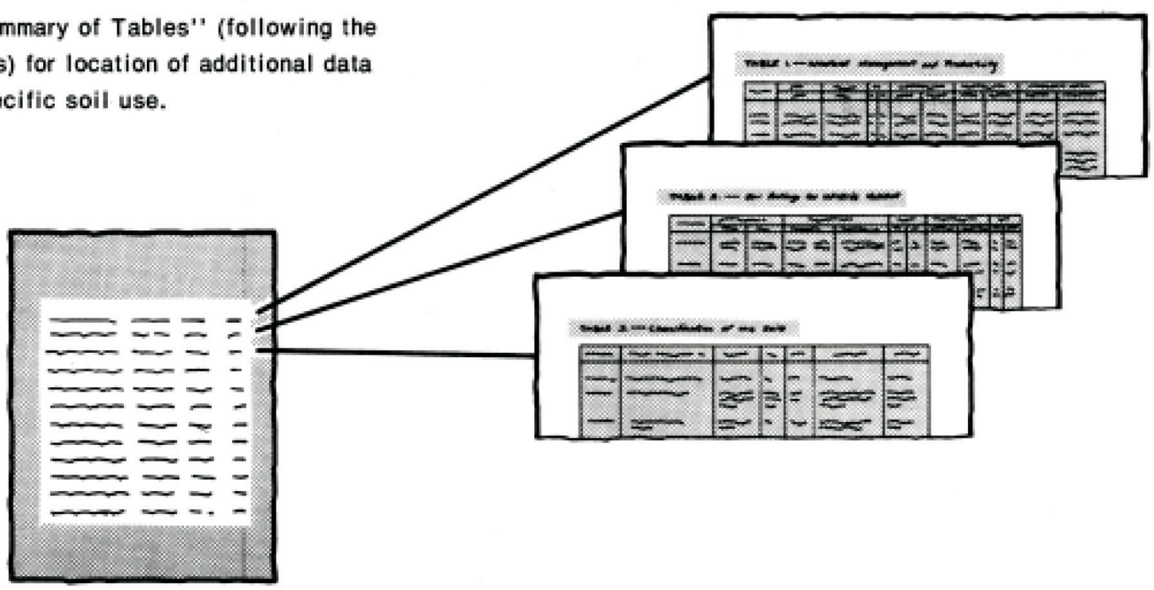


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

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, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1959-1976. Soil names and descriptions were approved in 1977. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1977. This survey was made cooperatively by the United States Department of Agriculture, Soil Conservation Service and Forest Service, and the South Dakota Agricultural Experiment Station. It is part of the technical assistance furnished to the Perkins County and Tri-County Conservation Districts. Perkins County contributed funds for the completion of the survey.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: Rabbit Butte, a prominent landmark in southern Perkins County. The stony Cabba and Wayden soils are on the sides of the butte; Lantry and Rhoades soils are in the foreground.

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Issued May 1980

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Foreword

The Soil Survey of Perkins County, South Dakota contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

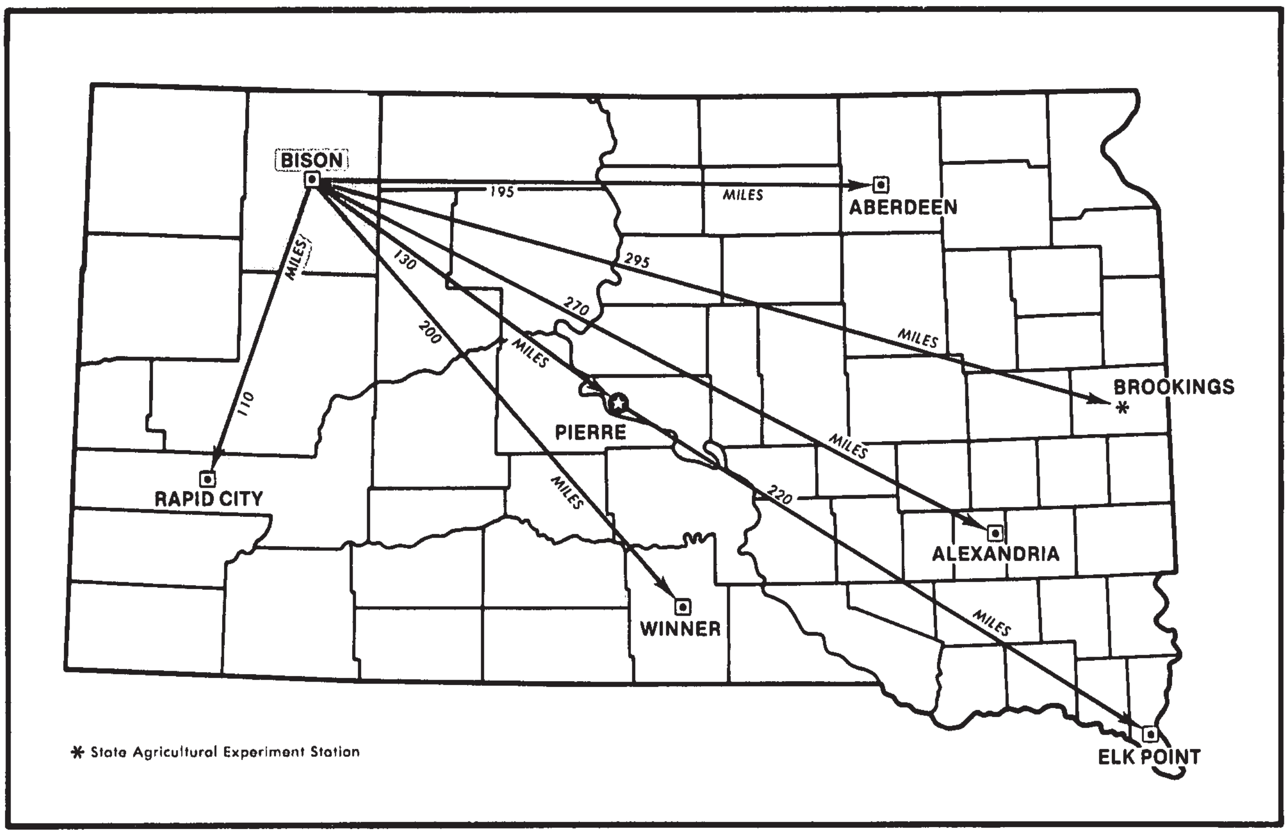
This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

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

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.

R.D. Swenson
State Conservationist
Soil Conservation Service



Location of Perkins County in South Dakota.

SOIL SURVEY OF PERKINS COUNTY, SOUTH DAKOTA

By C. Howard Wiesner, Soil Conservation Service

Soils surveyed by C. Howard Wiesner, Earl G. Chamberlin, John Kalves, Michael J. Lacompte, Arvid C. Meland Dale Melius, Toivo J. Ollila, and Adrian A. Parmeter, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service and Forest Service, in cooperation with the South Dakota Agricultural Experiment Station

PERKINS COUNTY is in the northwestern part of South Dakota (see map on facing page). The second largest county in South Dakota, it has a total of 2,866 square miles, or 1,834,240 acres. Of this total, about 10,830 acres is water.

The population of Perkins County in 1970 was 4,769. Bison, the county seat, had a population of 406. Lemmon, the largest town, had 1,997. Of the total in the county, 2,272 lived on farms and ranches.

Perkins County is on an upland plain dissected by streams and entrenched drainageways. The soils are mostly moderately deep to shallow, loamy, and nearly level to steep. The elevation is between 2,600 and 3,000 feet in most of the county but ranges from about 2,200 feet along the Moreau River in the southeastern part of the county to more than 3,000 feet on some of the ridges and buttes in the northwestern part.

The climate of Perkins County is continental. Summers are hot, and winters are cold. The mean annual temperature is about 44 degrees F. The annual precipitation is about 16 inches.

Farming and ranching are the main enterprises. Wheat is grown for cash income. Corn, oats, barley, alfalfa, and tame grasses are grown to provide feed and forage for livestock. Bison and Lemmon are the main business centers that provide supplies and services to farmers and ranchers.

General nature of the county

This section gives general information concerning the county. It describes climate, physiography and relief, settlement, and farming.

Climate

Perkins County is usually warm in summer and has frequent spells of hot weather and occasional cool days. It is very cold in winter, when Arctic air frequently surges over the county. Most of the precipitation falls during the warm period and is normally heaviest late in spring and early in summer. Winter snowfall is normally not too heavy, and it is blown into drifts so that much of the ground is free of snow.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Bison for the period 1952 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 19 degrees F, and the average daily minimum temperature is 9 degrees. The lowest temperature on record, which occurred at Bison on January 20, 1954, is minus 30 degrees. In summer the average temperature is 69 degrees, and the average daily maximum temperature is 83 degrees. The highest recorded temperature, which occurred on July 11, 1973, is 107 degrees.

Growing degree days, shown in table 1, are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 13 inches, or 76 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 11 inches. The heaviest 1-day rainfall during the period of record was 3.24 inches at Bison on April 30, 1967. Thunderstorms occur on about 29 days each year, and 21 of these days are in summer.

Average seasonal snowfall is 30 inches. The greatest snow depth at any one time during the period of record was 20 inches. On the average, 16 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 45 percent. Humidity is higher at night, and the average at dawn is about 60 percent. The percentage of possible sunshine is 65 in summer and 50 in winter. The prevailing wind is from the northwest during winter and from the south-southeast during summer. Average windspeed is highest, 13 miles per hour, in winter.

Blizzards occur several times each winter. Hail falls during summer thunderstorms in scattered small areas.

Climatic data in this section were specially prepared for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina.

Physiography and relief

Perkins County is on the Missouri Plateau of the Great Plains physiographic province. The northern half is drained by the Grand River and its tributaries. The southern half is drained by the Moreau River and its tributaries. Both drainage systems flow easterly to the Missouri River.

The landscape of the county is an upland plain that is moderately dissected by streams and entrenched drainageways. Relief is gently rolling to steep in much of the county, and a few prominent buttes and ridges are on the landscape. Slopes are mostly nearly level to moderately sloping on the Bison Table in the central part of the county. This broad plateau is a drainage divide between the Grand River and Moreau River drainage systems. Slopes are mostly nearly level to gently sloping in the extreme northeast part of the county near the town of Lemmon.

Settlement

The area that is now Perkins County was first established as Martin County by an act of the 1881 session of the Dakota Territory legislature. The 1883 legislature divided the area into Choteau, Martin, Rinehart, and Wagner Counties. Because the counties were unorganized, the 1897 session of the South Dakota legislature dissolved them and made the area a part of Butte County. Perkins County was created as a result of an election in 1908 and was organized in 1909. Bison was selected as the county seat.

Large cattle enterprises operating on the fenceless public domain moved into the area between 1880 and 1900. Some of the employees remained in the area and filed homesteads on what became their ranch headquarters. The Bismarck to Black Hills Trail crossed the county, and a few of the travelers became settlers. The first large inflow of settlers occurred between 1900 and 1910. The first U.S. Census of Perkins County, in 1910, listed a population of 11,348. Drought, cold winters, and other hardships, however, caused many of these settlers to leave. By 1915, the population dropped to an estimated third of the 1910 total.

The construction of a railroad along the north county line brought another inflow of settlers. By 1930, the population was 6,087. Another sharp decrease occurred because of the drought and depression during the 1930's. Since then, the population has been declining. Bison and Lemmon are the only incorporated towns. Lodgepole, Meadow, Prairie City, Shadehill, Sorum, Usta, White Butte, and Zeona are rural stores and post offices. Of the 4,769 residents in the county in 1970, about 2,000 lived on farms and ranches. All of the population is classed as rural.

Farming

The first settlers in Perkins County were mainly cattle ranchers. These ranchers homesteaded as much land as the law allowed and pastured their livestock on unfiled open range. Farming became more important when more land was homesteaded. Spring wheat was the main crop, and the acreage in spring wheat was increased to meet food needs during World War I.

After World War I, the acreage in crops continued to increase. Many farms were small and diversified. Spring wheat was grown for cash income, and increasing acreages of corn, oats, and barley were grown to feed hogs and chickens and to feed cows kept for milk production. During this period, only a small amount of crop residue was left on the soil, stubble fields commonly were burned, and the small pastures were overgrazed. As a result, the soils were highly susceptible to erosion and soil blowing when the drought came in 1933.

The drought and the poor economic conditions in the 1930's caused many of the smaller farmers to lose their farms to creditors. In an effort to encourage livestock ranching, the Federal Government purchased about 125,000 acres of submarginal cropland in the northern part of the county. Cultivated areas were seeded to grass, water facilities for livestock were developed, and pastures were fenced. This land was administered by the Soil Conservation Service for a number of years. It is now the Grand River National Grasslands and is administered by the Forest Service.

A soil conservation district enabling act passed by the South Dakota legislature in 1937 stirred the interest of landowners in the southeastern part of the county. As a result, the Tri-County Soil Conservation District was formed in the same year. It included 10 townships in the southeastern part of Perkins County and parts of adjacent Meade and Ziebach Counties.

This early conservation district had many problems. The soils were subject to soil blowing, the more sloping soils were subject to erosion when rain fell, the condition of the range deteriorated because of the drought, livestock water facilities were few, and the supply of winter feed was inadequate.

The Tri-County Conservation District attacked these problems by seeding many acres of cropland to grass, by installing water-spreading systems to increase hay production, and by constructing ponds to distribute grazing. Many other conservation practices were applied on cropland to control erosion and soil blowing and conserve moisture.

The accomplishments of the Tri-County Conservation District encouraged the landowners to form the Perkins

County Conservation District in 1955. This district includes all of Perkins County but the 10 townships in the Tri-County Conservation District.

About 24 percent of the county is cropland. Of this total, about 130,000 acres is seeded to alfalfa and tame grasses (*3*). About 75 percent of the county is rangeland. The small, diversified farms that were prevalent in the 1920's and 1930's are rare. Winter wheat has become an important crop, but spring wheat is still the main crop grown for cash income. Most of the cropland is used to grow feed and forage crops for livestock.

The limited capability of many of the soils and the climatic limitations of the area indicate that the future economy of the county probably will continue to be based on the grazing of livestock. Selected soils will continue to be used for wheat, but much of the cropland will probably continue to supply feed for livestock.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; 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, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After a guide for classifying and naming the soils was worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, 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 soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land-use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land-use planning

The general soil map at the back of this publication shows, in color, map units that have a distinct pattern of soils and of relief and drainage. Each map unit is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

The units on the general soil map have been grouped for broad interpretive purposes. The four broad groups and the 13 map units are described on the pages that follow. The names and boundaries of the map units do not coincide exactly with those on the recently published general soil map of adjacent Butte County. They do not coincide because of differences in detail of the two general soil maps and because of changes in the application of the soil classification system.

Map unit descriptions

Areas dominated by well drained to excessively drained, gently sloping to steep soils

These soils are on ridges, hills, and breaks extending back from some of the major streams and their tributaries. They are dominantly moderately sloping to steep, but they are less sloping on some of the lower parts of the landscape and on some of the broader ridgetops. The steeper soils are mostly loamy and are shallow over sandstone and siltstone. The moderately deep loamy soils are on the less steep parts of the landscape.

These soils make up about 29 percent of the county. Most of the acreage remains in native grass and is used for range. Between 10 and 15 percent of the acreage is cropped. Most of this cropland is used for feed and forage crops.

1. Vebar-Reeder-Cohagen

Moderately deep and shallow, well drained to excessively drained, gently sloping to steep loamy and sandy soils underlain by sandstone; on uplands

The landscape of this map unit is mainly one of ridges, hills, and breaks that extend 1 mile to several miles back from some of the major streams and their tributaries. Typically, it is dissected by prominent drainageways that flow into the larger streams. Slopes are dominantly 6 to 25 percent but range from 2 to 40 percent.

This map unit makes up about 14 percent of the county. It is about 30 percent Vebar soils, 15 percent Reeder soils, 15 percent Cohagen soils, and 40 percent minor soils.

Vebar soils are well drained, are gently sloping to moderately steep, and are on the mid and lower sides of ridges and hills and on some of the broader ridgetops. They have a surface layer of dark brown fine sandy loam and a subsoil of very friable and friable fine sandy loam. The subsoil is brown in the upper part and light yellowish brown in the lower part. Light gray, calcareous sandstone is at a depth of 28 inches.

Reeder soils are well drained, are gently sloping to moderately sloping, and are on some of the broader ridgetops. They have a surface layer of dark grayish brown loam and a subsoil of friable clay loam. The subsoil is brown in the upper part, light olive brown in the next part, and light yellowish brown in the lower part. The underlying material is pale yellow, calcareous loam. Pale olive and light yellowish brown, calcareous sandstone is at a depth of 32 inches.

The shallow Cohagen soils are well drained to excessively drained, are mostly moderately sloping to steep, and generally are on the tops and upper sides of ridges and hills. They have a thin surface layer of brown, calcareous loamy very fine sand. The underlying material is pale brown, calcareous, very friable loamy very fine sand. Pale brown and pale yellow, calcareous sandstone is at a depth of 16 inches.

Minor in this map unit are the moderately deep Amor and Lefor soils on the sides of ridges and hills, the shallow Cabba soils on some of the narrow ridgetops, the moderately deep Lantry soils below areas of Cabba soils, the deep Shambo and Trembles soils on narrow bottoms along large drainageways, and the deep Tally soils on foot slopes. Rock outcrop is near the crest of ridges and hills in some areas.

The major soils in this map unit are medium to low in fertility. Available water capacity is low or very low, and permeability is moderately rapid or moderate. Runoff is medium to rapid in most areas.

The Vebar and Reeder soils that have slopes of less than 9 percent are suited to cultivated crops, tame pasture and hayland, and windbreaks and environmental plantings. These soils generally are on foot slopes and on the broader drainage divides. The strongly sloping to steep soils, which are dominant in this map unit, are best suited to range.

Slope and depth to bedrock are the main limitations for engineering uses. Deep cuts are required for road construction throughout much of the unit, but generally the bedrock is rippable. Wells and ponds provide water for livestock. The soils are permeable, and chemical treatment and compaction generally are needed to prevent seepage from sewage lagoons and farm ponds.

About 15 percent of the acreage of this unit is used for crops, mainly feed and forage crops that provide winter feed for livestock. Wheat is grown in some areas. Formerly farmed areas in the Grand River National Grasslands have been seeded to tame and native grasses. Cattle ranching is the main type of farming.

2. Cabba-Lantry-Amor

Shallow and moderately deep, well drained, moderately sloping to steep loamy soils underlain by siltstone and sandstone; on uplands

The landscape of this map unit is mainly one of ridges, hills, and breaks that extend 1 mile to several miles back from some of the major streams and their tributaries. It is dissected by entrenched drainageways that flow into the larger streams. Some of the prominent ridges are somewhat benched. Slopes typically are 6 to 40 percent, but lesser slopes are on the broader ridgetops, benches, and narrow bottoms along the larger drainageways.

This map unit makes up about 15 percent of the county. It is about 30 percent Cabba soils, 20 percent Lantry soils, 15 percent Amor soils, and 35 percent minor soils (fig. 1).

The shallow Cabba soils are mostly strongly sloping to steep and are on the tops and upper sides of ridges and hills. They have a thin surface layer of grayish brown loam. The underlying material is light brownish gray, calcareous, friable silt loam. Light gray, calcareous, soft siltstone is at a depth of 14 inches.

The moderately deep Lantry soils are mostly moderately sloping to moderately steep and typically are on the sides of ridges and hills directly below Cabba soils. They have a thin surface layer of grayish brown, calcareous loam and a subsoil of light brownish gray, calcareous, very friable loam and silt loam. The underlying material is light brownish gray, calcareous silt loam. Light brownish gray, calcareous siltstone and sandstone are at a depth of 26 inches.

The moderately deep Amor soils are mostly moderately sloping to strongly sloping and are on the lower parts of the landscape below Cabba and Lantry soils or are on some of the broader ridges and hilltops above Cabba soils. They have a surface layer of dark grayish brown loam and a subsoil of brown and light brownish gray, friable loam. The underlying material is light yellowish brown, calcareous loam. Light yellowish brown, calcareous siltstone is at a depth of 34 inches.

Minor in this map unit are the shallow sandy Cohagen soils on some of the ridges; the deep, well drained and moderately well drained Daglum and Rhoades soils on terraces and upland flats; the moderately deep, well drained loamy Morton and Reeder soils on broad ridgetops; the deep, well drained loamy Shambo and Trembles soils on low terraces and bottom land along drainageways; and the deep and moderately deep, well drained loamy Tally and Vebar soils on the mid and lower parts of the landscape below Cohagen soils. Rock outcrop is around the head of drainageways or on the upper sides of ridges. Slickspots are intermingled with Daglum and Rhoades soils. They have salts near the surface. Daglum and Rhoades soils have a claypan subsoil and contain sodium.

Fertility is low in Cabba and Lantry soils and medium in Amor soils. Available water capacity is very low or low in Cabba and Lantry soils and low or moderate in Amor soils. Permeability is moderate in all of the major soils, and runoff is medium to rapid.

Amor soils and some of the minor soils are suited to cultivated crops, tame pasture and hayland, and windbreaks and environmental plantings. The steeper Cabba and Lantry soils generally are best suited to range.

Slope, depth to bedrock, low strength, and a moderate shrink-swell potential limit this map unit for engineering uses. Deep cuts are required for road construction throughout much of the unit, but the bedrock generally is rippable. Wells and ponds provide water for livestock. The soils are permeable, and chemical treatment and compaction generally are needed to prevent seepage from sewage lagoons and farm ponds.

About 10 percent of the acreage of this unit is used for crops, mainly feed and forage crops that provide winter feed for livestock. Wheat is grown in some areas. Formerly farmed areas in the Grand River National Grasslands have been seeded to tame and native grasses. Cattle ranching is the main type of farming.

Areas dominated by well drained, nearly level to strongly sloping soils

These soils are on uplands on drainage divides. They are dominantly nearly level to moderately sloping but are steeper on the sides of some of the ridges and hills and along some of the drainageways that head in these areas. The soils are loamy or silty and are dominantly moderately deep and deep over sandstone, siltstone, and shale.

These soils make up about 25 percent of the county. About 55 percent of the acreage is cropped. Much of the cropland in the county is concentrated in areas of these soils. Wheat for cash income is an important crop, but feed and forage crops also are grown.

3. Regent-Reeder-Amor

Moderately deep, well drained, gently sloping to strongly sloping silty and loamy soils underlain by siltstone, sandstone, and shale; on uplands

This map unit is on a moderately dissected upland plain. Many of the drainageways that flow through the Vebar-Reeder-Cohagen and Cabba-Lantry-Amor map units to the larger streams head in areas of this map unit. Slopes are dominantly 2 to 9 percent but are steeper along the larger drainageways and are nearly level in swales and on some of the broader ridges.

This map unit makes up about 9 percent of the county. It is about 20 percent Regent soils, 15 percent Reeder soils, 15 percent Amor soils, and 50 percent minor soils.

Regent soils are gently sloping to strongly sloping. They have a surface layer of dark grayish brown silty clay loam. The subsoil is firm silty clay loam. It is grayish brown in the upper part and light brownish gray in the lower part. The underlying material is light brownish gray, calcareous silty clay loam. Light brownish gray, calcareous siltstone is at a depth of 35 inches.

Reeder soils are mostly gently sloping to moderately sloping. They have a surface layer of dark grayish brown loam. The subsoil is friable clay loam. It is brown in the upper part, light olive brown in the next part, and light yellowish brown in the lower part. The underlying material is pale yellow, calcareous loam. Pale olive and light yellowish brown, calcareous sandstone is at a depth of 32 inches.

Amor soils are mostly moderately sloping to strongly sloping and commonly are on the side slopes adjacent to the larger drainageways. They have a surface layer of dark grayish brown loam and a subsoil of brown and light brownish gray, friable loam. The underlying material is light yellowish brown, calcareous loam. Light yellowish brown, calcareous siltstone is at a depth of 34 inches.

Minor in this map unit are the deep, well drained and moderately well drained Arnegard, Belfield, and Grail soils in swales; the shallow, well drained Cabba and Wayden soils on ridges; the deep, well drained and moderately well drained Daglum and Rhoades soils on foot slopes and in swales; the moderately deep, well drained Lantry and Vebar soils on the upper sides of ridges; and the deep, well drained Farnuf and Savage soils on foot slopes. Belfield, Daglum, and Rhoades soils have a claypan subsoil and contain sodium.

The major soils are medium in fertility. Available water capacity is low or moderate. Permeability is slow in the Regent soils and moderate in the Reeder and Amor soils. The shrink-swell potential is moderate to high. Runoff is medium.

If carefully managed, the major soils are suited to crops, tame pasture and hayland, and windbreaks and environmental plantings. Some of the minor soils and the strongly sloping major soils are best suited to range.

The soils in this unit have moderate to severe limitations for engineering uses because of the shrink-swell potential, low strength, and depth to bedrock. Slope also is a limitation in some areas. Wells and ponds provide water for livestock. Waste disposal systems are best installed on the lower parts of the landscape where the soils are deeper and less sloping. Throughout much of the unit, chemical treatment and compaction generally are needed to prevent seepage from sewage lagoons and farm ponds.

About 40 percent of the acreage of this unit is cropped. Wheat is grown as a cash crop, but much of the cropland is used for feed and forage crops that provide winter feed for livestock. Cattle ranching and general livestock farming are the main types of farm enterprises.

4. Savage-Regent

Deep and moderately deep, well drained, nearly level and gently sloping silty soils formed in alluvium and in material weathered from siltstone and shale; on uplands

This map unit is on a smooth upland plain on drainage divides between the major streams. Local differences in elevation generally are less than 30 feet. Well defined drainageways are in slightly depressed areas. Slope ranges from 0 to 6 percent.

This map unit makes up about 1 percent of the county. It is about 45 percent Savage soils, 35 percent Regent soils, and 20 percent minor soils.

The deep Savage soils generally are on the lower parts of the landscape. They have a surface layer of grayish brown silty clay loam. The subsoil is firm clay. It is dark grayish brown in the upper part, grayish brown in the next part, and light yellowish brown in the lower part. The underlying material is light brownish gray, calcareous clay and clay loam.

The moderately deep Regent soils are on slight rises and are mostly gently sloping. They have a surface layer of dark grayish brown silty clay loam and a subsoil of firm silty clay loam. The subsoil is grayish brown in the upper part and light brownish gray in the lower part. The underlying material is light brownish gray, calcareous silty clay loam. Light brownish gray, calcareous siltstone is at a depth of 35 inches.

Minor in this map unit are the deep, well drained and moderately well drained Arnegard, Belfield, Daglum, and Grail soils in some of the swales; the shallow, well drained Cabba and Wayden soils on some of the ridges; and the moderately deep, well drained Reeder and Vebar soils on the tops and upper sides of ridges above Regent soils. Belfield and Daglum soils have a claypan subsoil and contain sodium.

The major soils are medium in fertility. They shrink and swell upon drying and wetting. Available water capacity is moderate or high, and permeability is moderately slow or slow. Runoff is slow to medium.

If carefully managed, the major soils are suited to crops, tame pasture and hayland, and windbreaks and environmental plantings. The shallow minor soils are best suited to range.

The high shrink-swell potential, low strength, and permeability of the major soils are the main limitations for engineering uses. Farm ponds generally hold water satisfactorily. Sewage lagoons function well, but the absorption area in septic tank filter fields should be enlarged to overcome the slow absorption of liquid waste. Low strength limits the ability of these soils to support vehicular traffic, but strengthening the base material helps to overcome this limitation.

About 75 percent of the acreage of this unit is cropped. Wheat is the main cash crop. Corn, oats, barley, alfalfa, and tame grasses are grown to provide feed and forage for livestock. Wheat farming and general livestock farming are the main types of farm enterprises.

5. Morton-Lantry

Moderately deep, well drained, nearly level to strongly sloping loamy soils underlain by siltstone and sandstone; on uplands

The landscape of this map unit is one of smooth upland plains on drainage divides between the major streams. The largest area is the drainage divide between the Grand River and Moreau River drainage systems. Local differences in elevation generally are less than 30 feet but range to 50 feet on the sides of the larger drainageways. Slopes are dominantly 2 to 9 percent but range from 0 to 15 percent.

This map unit makes up about 13 percent of the county. It is about 60 percent Morton soils, 15 percent Lantry soils, and 25 percent minor soils (fig. 2).

Morton soils are mostly nearly level to moderately sloping. They have a surface layer of brown loam. The subsoil is brown and pale brown, friable silty clay loam. The underlying material is light gray and pale olive, calcareous silty clay loam. Pale olive, calcareous siltstone is at a depth of 32 inches.

Lantry soils generally are on the higher parts of the landscape above Morton soils or are on the sides of the more deeply entrenched drainageways. They are mostly moderately sloping and strongly sloping. They have a thin surface layer of grayish brown, calcareous loam. The subsoil is light brownish gray, calcareous, very friable loam and silt loam. The underlying material is light brownish gray, calcareous silt loam. Light brownish gray, calcareous siltstone and sandstone are at a depth of 26 inches.

Minor in this map unit are the deep, well drained and moderately well drained Arnegard, Belfield, and Grail soils in swales; the shallow, well drained Cabba soils on ridgetops; the deep, well drained and moderately well drained Daglum and Rhoades soils on foot slopes and along drainageways; the deep, poorly drained and very poorly drained Dimmick and Heil soils in closed depressions; and the moderately deep, well drained Amor, Reeder, Regent, and Vebar soils on some of the rises. Belfield, Daglum, and Rhoades soils have a claypan subsoil and contain sodium.

Fertility is medium in Morton soils and low in Lantry soils. Available water capacity is moderate in Morton soils and low in Lantry soils. Permeability is moderate in both soils. The shrink-swell potential also is moderate. Runoff is medium in most areas.

The Morton soils and some of the minor soils are suited to crops, tame pasture and hayland, and windbreaks and environmental plantings. The Lantry soils that have slopes of less than 9 percent can be used for these purposes, but the steeper areas are best suited to range.

The moderate depth to bedrock, the moderate shrink-swell potential, and the low strength are the main limitations of this map unit for engineering uses. The bedrock is rippable and generally can be easily moved by machinery during the construction of buildings and roads. The bedrock and the slow absorption of liquid waste are limitations if septic tank absorption fields are installed in these soils. Wells and ponds provide water for livestock. The soils are permeable, and chemical treatment and compaction generally are necessary to prevent seepage from ponds or sewage lagoons.

About 65 percent of the acreage of this unit is cropped. Wheat is the main cash crop. Corn, oats, barley, alfalfa, and tame grasses are grown to provide feed and forage for livestock. The strongly sloping soils generally remain in native grass and are used for range. Wheat farming and general livestock farming are the main types of farm enterprises.

6. Marmarth-Regent

Moderately deep, well drained, gently sloping and moderately sloping loamy and silty soils underlain by sandstone, siltstone, and shale; on uplands

This map unit is on an upland plain on a drainage divide. Differences in elevation generally are less than 40 feet. Slopes are mostly 2 to 9 percent but are steeper around the head of drainageways.

This map unit makes up less than 1 percent of the county. It is about 35 percent Marmarth soils, 25 percent Regent soils, and 40 percent minor soils.

Marmarth soils have a surface layer of dark grayish brown loam and a subsoil of grayish brown, friable loam. The underlying material is light gray, calcareous loam. Light gray and yellow, calcareous sandstone is at a depth of 25 inches.

Regent soils have a surface layer of dark grayish brown silty clay loam and a subsoil of firm silty clay loam. The subsoil is grayish brown in the upper part and light gray in the lower part. The underlying material is light brownish gray, calcareous silty clay loam. Light brownish gray, calcareous siltstone is at a depth of 35 inches.

Minor in this map unit are the deep, moderately well drained and well drained Absher, Grail, Loburn, and Savage soils on foot slopes and in swales; the shallow, well drained to excessively drained Blackhall, Cabbart, and Wayden soils on ridges and on the shoulders of entrenched drainageways; and the moderately deep, well drained Twilight soils below the Blackhall soils on the landscape. Absher and Loburn soils have a claypan subsoil and contain sodium.

The major soils are medium in fertility. Available water capacity is low to moderate. Permeability is moderate in the Marmarth soils and slow in the Regent soils. The shrink-swell potential is moderate to high. Runoff is medium in most areas.

If carefully managed, the major soils are suited to crops, tame pasture and hayland, and windbreaks and environmental plantings. Many of the minor soils are best suited to range.

The moderate depth to bedrock, the moderate to high shrink-swell potential, the slow absorption of liquid waste, and low strength are the main limitations for engineering uses. The bedrock is rippable and generally can be easily moved by machinery during the construction of buildings and roads. The depth to bedrock and the slow absorption of liquid waste are limitations if septic tank absorption fields are installed in these soils. Wells and ponds provide water for livestock. Seepage is a problem if ponds and sewage lagoons are constructed on the Marmarth soils.

About 50 percent of the acreage of this unit is cropped. Much of the cropland is used for feed and forage crops that provide winter feed for livestock. Wheat is grown as a cash crop in some areas. Areas that are not cropped remain in native grass and are used for range and hay. General livestock farming and cattle ranching are the main types of farming.

7. Yegen-Felor-Morton

Deep and moderately deep, well drained, gently sloping and moderately sloping loamy soils underlain by sandstone and siltstone; on uplands

This map unit is on an upland plain on a drainage divide between the Grand River and the Moreau River. The drainage pattern is well defined, and small drainageways head in areas of this unit. Slopes are dominantly 2 to 9 percent but are steeper along some of the drainageways.

This map unit makes up about 1 percent of the county. It is about 30 percent Yegen soils, 20 percent Felor soils, 20 percent Morton soils, and 30 percent minor soils.

Yegen soils are deep over sandstone. They have a surface layer of dark grayish brown loam or sandy loam. The subsoil is friable sandy clay loam. It is brown in the upper part, pale brown in the next part, and pale yellow in the lower part. The underlying material is pale yellow, calcareous sandy clay loam. Pale yellow sandstone is at a depth of 51 inches.

The deep Felor soils have a surface layer of grayish brown and dark grayish brown loam. The upper part of the subsoil is brown, friable sandy clay loam, and the lower part is pale yellow and light brown, firm silty clay. The underlying material is white and light reddish brown, calcareous silty clay.

Morton soils are moderately deep over siltstone or sandstone. They have a surface layer of brown loam and a subsoil of brown and pale brown, friable silty clay loam. The underlying material is light gray and pale olive, calcareous silty clay loam. Pale olive, calcareous siltstone is at a depth of 32 inches.

Minor in this map unit are the deep, well drained and moderately well drained Arnegard, Belfield, Daglum, Farnuf, Rhoades, and Savage soils on foot slopes and in swales; the shallow, well drained to excessively drained Cabba and Cohagen soils on ridges; and the moderately deep Lantry, Reeder, and Vebar soils on the higher parts of the landscape. Belfield, Daglum, and Rhoades soils have a claypan subsoil and contain sodium.

The major soils are medium in fertility. Available water capacity is moderate to high. Permeability is moderate in the upper part of the Yegen soils and moderate or moderately rapid in the lower part. It is moderate in the upper part of the Felor soils and slow in the lower part. It is moderate in the Morton soils. The shrink-swell potential is moderate to high in all of the major soils. Runoff is medium.

If carefully managed, the major soils can be used for crops, tame pasture and hayland, and windbreaks and environmental plantings. Some of the minor soils are best suited to range.

The moderate depth to bedrock, the moderate to high shrink-swell potential, the slow absorption of liquid waste, and low strength are the main limitations for engineering uses. The bedrock is rippable and generally can be easily moved by machinery during the construction of buildings and roads. The depth to bedrock and the slow absorption of liquid waste are limitations if septic tank absorption fields are installed in these soils. Wells and ponds provide water for livestock. Seepage is a problem if ponds or sewage lagoons are constructed on the Morton or Yegen soils.

About 50 percent of the acreage of this unit is cropped. Much of the cropland is used for corn, oats, barley, alfalfa, and tame grasses that provide winter feed for livestock. Wheat is grown as a cash crop. Areas that are not cropped remain in native grass and are used for range and hay. General livestock farming is the main type of farming.

Areas dominated by well drained and moderately well drained, nearly level to strongly sloping soils

These soils are on upland plains that are moderately dissected by drainageways flowing to the major streams and their tributaries. They are dominantly gently sloping to rolling but are steeper on the sides of ridges, buttes, and entrenched drainageways. Small areas of nearly level soils are on upland flats and on narrow terraces along the larger drainageways. The soils are dominantly loamy and moderately deep over sandstone, siltstone, or shale. The steeper soils are shallow over bedrock. Sodium-affected claypan soils are in scattered areas. They limit the potential of this group of map units for various uses.

These soils make up about 35 percent of the county. Most of the acreage is in native grass and is used for range. About 10 percent or less of the acreage is used for cultivated crops. Much of the cropland is used for feed and forage crops.

8. Reeder-Rhoades-Lantry

Moderately deep, well drained, gently sloping to strongly sloping loamy soils and deep, moderately well drained, nearly level to strongly sloping claypan soils; underlain by sandstone, siltstone, and shale; on uplands

This map unit is on an upland plain that is moderately dissected by numerous drainageways that flow to Grand and Moreau Rivers and their tributaries. Slopes are dominantly 2 to 15 percent but are steeper on the sides of ridges, buttes, and entrenched drainageways. Small areas of nearly level soils are in drainage divides and on upland flats and narrow terraces.

This map unit makes up about 13 percent of the county. It is about 35 percent Reeder soils, 30 percent Rhoades soils, 15 percent Lantry soils, and 20 percent minor soils.

The moderately deep Reeder soils are mostly gently sloping to moderately sloping. They are at mid slope. They have a surface layer of dark grayish brown loam. The subsoil is friable clay loam. It is brown in the upper part, light olive brown in the next part, and light yellowish brown in the lower part. The underlying material is pale yellow, calcareous loam. Pale olive and light yellowish brown, calcareous sandstone is at a depth of 32 inches.

Rhoades soils generally are on foot slopes, on narrow terraces, and in swales, but in places they extend into the higher parts of the landscape along drainage sags and in saddles on the broader ridges. They are nearly level to strongly sloping. They have a thin surface layer of light brownish gray loam. The claypan subsoil is grayish brown, firm clay loam and silty clay. The underlying material is light yellowish brown, calcareous silty clay loam. Light yellowish brown, calcareous siltstone is at a depth of 43 inches.

The moderately deep Lantry soils are on the higher parts of the landscape and are mostly moderately sloping or strongly sloping. They have a thin surface layer of grayish brown, calcareous loam and a subsoil of light brownish gray, calcareous, very friable loam and silt loam. The underlying material is light brownish gray, calcareous silt loam. Light brownish gray, calcareous siltstone and sandstone are at a depth of 26 inches.

Minor in this map unit are the deep, well drained and moderately well drained Arnegard, Belfield, Daglum, and Grail soils on foot slopes and in swales; the shallow, well drained to excessively drained Cabba and Cohagen soils on the upper sides and tops of ridges, buttes, and hills; the moderately deep, well drained Regent and Vebar soils in positions similar to those of Reeder soils; the deep, well drained Savage soils on foot slopes below Regent soils; and the deep, moderately well drained and well drained Shambo soils on low terraces along the larger drainageways. Slickspots are intermingled with some of the areas of Daglum and Rhoades soils. They have salts at or near the surface. The Belfield and Daglum soils, like the Rhoades soils, have a claypan subsoil and contain sodium.

Reeder soils are medium in fertility, but the Rhoades and Lantry soils are low in fertility. All of the major soils are somewhat droughty. Available water capacity is low. Permeability is moderate in the Reeder and Lantry soils and very slow in the Rhoades soils. The shrink-swell potential is moderate to high. Runoff is medium throughout much of the unit.

If carefully managed, the Reeder soils are suited to crops, tame pasture and hayland, and windbreaks and environmental plantings. The Rhoades soils are not suited to these uses because of the restrictive claypan subsoil, and most areas of the Lantry soils are too steep and erodible for crops. The Rhoades and Lantry soils and the shallow minor soils are best suited to range.

The moderate depth to bedrock, the moderate to high shrink-swell potential, and the low strength of the major soils are the main limitations for engineering uses. The bedrock is rippable and generally can be easily moved by the earth-moving machinery used in road construction. The moderate depth to bedrock and the slow absorption of liquid waste should be overcome if these soils are used as septic tank absorption fields. The Rhoades soils are the best sites for sewage lagoons and farm ponds. Wells and ponds provide water for livestock. Seepage is a problem if ponds are constructed on the Reeder and Lantry soils.

About 15 percent of the acreage of this unit is cultivated. Much of the cropland is used for feed and forage crops for livestock, but wheat is grown for cash income in some areas. Formerly farmed areas in the Grand River National Grasslands have been seeded to tame and native grasses. Cattle ranching is the main type of farming.

9. Absher-Twilight

Deep, moderately well drained and well drained, nearly level to strongly sloping claypan soils and moderately deep, well drained, gently rolling and rolling loamy soils underlain by siltstone and sandstone; on uplands

This map unit is on an upland plain that is dissected by numerous drainageways that flow to the Moreau River. Slopes are dominantly 2 to 15 percent, but nearly level soils are on upland flats and on narrow terraces along drainageways. The steeper slopes are on the sides of ridges, buttes, and entrenched drainageways.

This map unit makes up about 22 percent of the county. It is about 30 percent Absher soils, 20 percent Twilight soils, and 50 percent minor soils (fig. 3).

Absher soils generally are on foot slopes, in swales, and on upland flats and terraces, but in places they extend into the higher parts of the landscape along drainage sags and in the saddles on some of the broader ridges. They are nearly level to strongly sloping. They have a thin surface layer of light brownish gray loam. The claypan subsoil is firm clay loam and clay. It is dark gray in the upper part, grayish brown in the next part, and pale olive in the lower part. The underlying material is light olive gray and gray, calcareous clay loam and clay.

The moderately deep Twilight soils generally are on the higher parts of the landscape and are mostly gently rolling or rolling. They have a thin surface layer of grayish brown fine sandy loam and a subsoil of brown and grayish brown, very friable fine sandy loam. The underlying material is light gray, calcareous fine sandy loam. Light gray, calcareous sandstone is at a depth of 34 inches.

Minor in this unit are the shallow, well drained to excessively drained Blackhall, Cabbart, and Wayden soils on the tops and upper sides of ridges and buttes and on the shoulders of entrenched drainageways; the deep and moderately deep, well drained Loburn and Parchin soils in positions similar to those of Absher soils; and the moderately deep, well drained Marmarth soils on some of the broader ridges. Rock outcrop is intermingled with Blackhall and Cabbart soils on the upper sides of ridges and buttes. Slickspots are intermingled with the areas of Absher soils. They have salts at or near the surface. The Loburn and Parchin soils, like the Absher soils, have a claypan subsoil and contain sodium.

The major soils are low in fertility. Available water capacity is moderate to low. Permeability is very slow in the Absher soils and moderately rapid in the Twilight soils. The shrink-swell potential is high or moderate in the Absher soils and in many of the minor soils. Runoff is medium to rapid.

The Absher soils are not suited to crops, tame pasture and hayland, and windbreaks and environmental plantings because of the restrictive claypan subsoil within 4 inches of the surface. The Twilight soils are not suited to these uses because of the severe hazards of erosion and soil blowing. Some of the minor soils, mainly the Marmarth soils, are suited to cultivated crops, but in many areas, they are so small in extent or are so closely intermingled with Absher and Twilight soils that farming is not practical. This map unit is best suited to range.

The high shrink-swell potential, the slow absorption of liquid waste, and the low strength of the Absher soils and of some of the minor soils severely limit engineering uses of this map unit. Also, slope and depth to bedrock limit engineering uses of Twilight soils and some of the minor soils. Wells and ponds provide water for livestock. Seepage is a problem if ponds are constructed on the Blackhall, Cabbart, Marmarth, or Twilight soils.

About 5 percent of the acreage of this unit is cultivated. Much of the cropland is areas of the minor Marmarth soils and is used mainly for feed and forage crops for livestock. Most areas remain in native grass and are used for range. Cattle and sheep ranching are the main types of farming.

Areas dominated by nearly level and gently sloping soils that are well drained to excessively drained or are poorly drained

These soils are on bottom land and terraces along the major streams in the county. Slopes are mostly nearly level. The soils are loamy and sandy and are mostly well drained. Some of the soils on terraces are underlain by sand and gravel at a moderate depth.

These soils make up about 11 percent of the county. About 20 percent of the acreage is cropped. Most of the cropland is used for feed and forage crops. About 80 percent of the acreage is in native vegetation and is used for range and hay.

10. Banks-Trembles-Shambo

Deep, well drained to excessively drained, nearly level and gently sloping sandy and loamy soils formed in alluvium on bottom land and terraces

This map unit is on the bottom land and low terraces along the Grand River and its main tributaries. Slopes are mostly nearly level but are steeper on terrace fronts and on fans along the edges of the map unit. The surface is uneven in some areas because of meander scars. The lower areas are subject to stream flooding.

This map unit makes up about 3 percent of the county. It is about 40 percent Banks soils, 25 percent Trembles soils, 15 percent Shambo soils, and 20 percent minor soils.

Banks soils generally are on the lower flood plains near the stream channel and are mostly nearly level. They have a surface layer of light brownish gray, calcareous loamy fine sand. The underlying material is light gray and light brownish gray, calcareous sandy loam, loamy fine sand, and fine sand.

Trembles soils generally are at the lower levels of the landscape and are mostly nearly level. They have a surface layer of grayish brown fine sandy loam. The underlying material is light brownish gray, calcareous, very friable fine sandy loam stratified with lenses of loamy fine sand and very fine sandy loam.

Shambo soils generally are on low terraces and fans above the Banks and Trembles soils and are nearly level and gently sloping. They have a surface layer of grayish brown and brown loam and a subsoil of brown and light brownish gray, friable loam. The underlying material is light yellowish brown, calcareous loam between depths of 31 and 42 inches and grayish brown, calcareous gravelly sandy loam below a depth of 42 inches. In channeled areas the underlying material contains sand within a depth of 40 inches.

Minor in this map unit are the well drained Farnuf, Manning, Tally, and Stady soils on moderately high terraces; the moderately well drained Lohler soils in low areas on bottom land; the excessively drained Wabek soils on terrace fronts; and the excessively drained Zeona soils on terraces. Manning, Stady, and Wabek soils are underlain by sand and gravel within a depth of 40 inches.

Banks and Trembles soils are low in fertility, and Shambo soils are medium in fertility. Available water capacity is low in the Banks soils and moderate to high in the Trembles and Shambo soils. Permeability is rapid in the Banks soils, moderately rapid in the Trembles soils, and moderate in the upper part of the Shambo soils. The water table generally is below a depth of 6 feet but in some years is as shallow as 4 feet in the Banks soils. Runoff is slow.

The Banks soils generally are not suited to dryfarming because the hazard of soil blowing is severe. If carefully managed, the larger areas of Trembles and Shambo soils are suited to cultivated crops, tame pasture and hayland, and windbreaks and environmental plantings. Channeled areas of Trembles and Shambo soils generally are not suited to cultivated crops because they are narrow or irregularly shaped. Many areas of this unit are best suited to range.

The hazard of flooding is the main concern in managing this map unit for engineering uses. Roads should be graded above expected flood levels. The higher lying Shambo soils and some of the minor soils that are not subject to flooding are the best sites for buildings and waste disposal systems. The effluent from waste disposal systems can pollute shallow ground water. Wells and streams provide livestock water.

About 10 percent of the acreage of this map unit is cultivated. Most of the cropland is used for feed and forage crops for livestock. The uncultivated acreage is in native grass and is used for range and hay. The scattered native trees and shrubs along stream channels provide winter cover for livestock and wildlife. Cattle ranching is the main type of farming. A number of ranch headquarters are on this map unit.

11. Farnuf-Shambo-Fluvaquents

Deep, well drained and poorly drained, nearly level and gently sloping loamy soils formed in alluvium on terraces and bottom land

This map unit is on valley terraces and bottom land along Flat and Thunder Hawk Creeks. Slopes are mostly nearly level but are gently sloping on terrace fronts and on fans along the edges of the map unit. Some of the lower areas of Shambo soils and Fluvaquents are subject to stream flooding.

This map unit makes up less than 1 percent of the county. It is about 45 percent Farnuf soils, 25 percent Shambo soils, 20 percent Fluvaquents, and 10 percent minor soils.

Farnuf soils are on terraces, terrace fronts, and fans and are nearly level and gently sloping. They have a surface layer of brown loam. The subsoil is brown, friable clay loam over light brownish gray, calcareous loam. The underlying material is light yellowish brown and light brownish gray, calcareous loam.

Shambo soils are on low terraces and bottom land that in places are dissected by channels. They are nearly level and gently sloping. They have a surface layer of grayish brown and brown loam. The subsoil is brown and light brownish gray loam. The underlying material is light yellowish brown, calcareous loam over grayish brown, calcareous gravelly sandy loam, which is below a depth of 42 inches. In channeled areas the underlying material contains sand within a depth of 40 inches.

Fluvaquents are on bottom land, are nearly level, and are poorly drained. They have salts at or near the surface. The surface layer ranges from sandy loam to clay. The underlying material is dominantly loam and is stratified by finer and coarser material ranging from clay to sand or sand and gravel.

Minor in this map unit are the well drained and moderately well drained Belfield, Daglum, Rhoades, and Savage soils in slightly depressed low areas on terraces and the moderately well drained clayey Lohler soils and well drained loamy Trembles soils on bottom land. The Belfield, Daglum, and Rhoades soils have a claypan subsoil and contain sodium.

Fertility is medium in the Farnuf and Shambo soils. It is low in the Fluvaquents because of excessive salts. Available water capacity is high or moderate in the Farnuf and Shambo soils. Permeability is moderate in the Farnuf and Shambo soils and slow to moderately rapid in the Fluvaquents. The water table is at or near the surface during much of the growing season in the areas of Fluvaquents. Runoff is slow.

Farnuf soils and some areas of the Shambo soils are suited to crops, tame pasture and hayland, and windbreaks and environmental plantings. Fluvaquents and the channeled Shambo soil generally are best suited to range.

The wetness resulting from a high water table and the flooding are the main limitations to engineering uses of the lower areas of this map unit. The slow absorption of liquid waste and the moderate shrink-swell potential are limitations to engineering uses of the Farnuf soils. Roads should be graded above expected flood levels. Buildings and waste disposal systems can be constructed on the higher lying Farnuf soils. Wells and streams provide livestock water. The Farnuf soils and the Shambo soils that are high on the landscape have potential for irrigation.

About 20 percent of the acreage of this unit is cropped. Much of the cropland is areas of Farnuf soils and is used for feed and forage crops for livestock. About 80 percent of the acreage is in native grass and is used for range and hay. Cattle ranching is the main type of farming.

12. Shambo-Farnuf-Stady

Deep, well drained, nearly level and gently sloping loamy soils and well drained, nearly level loamy soils that are moderately deep over sand and gravel; formed in alluvium on terraces

This map unit is mainly on terraces along the major streams. Some of the terraces are as much as 80 feet above the flood plain, but many are low terraces that include narrow areas of bottom land along stream channels. The lower areas commonly are dissected by stream channels and meander scars. Slopes are dominantly less than 3 percent but are steeper on terrace fronts. The lower areas are subject to stream flooding.

This map unit makes up about 3 percent of the county. It is about 35 percent Shambo soils, 25 percent Farnuf soils, 20 percent Stady soils, and 20 percent minor soils.

Shambo soils are on low terraces and bottom land that in many areas are dissected by stream channels and meander scars. They are nearly level or gently sloping. They have a surface layer of grayish brown and brown loam. The subsoil is brown and light brownish gray, friable loam. The underlying material is light yellowish brown, calcareous loam over grayish brown, calcareous gravelly sandy loam, which is below a depth of 42 inches. In channeled areas the underlying material contains sand within a depth of 40 inches.

Farnuf soils are on terraces, terrace fronts, and fans above the Shambo soils and are nearly level and gently sloping. They have a surface layer of brown loam. The subsoil is brown, friable clay loam over light brownish gray, calcareous loam. The underlying material is light yellowish brown and light brownish gray, calcareous loam.

Stady soils are on the higher terraces and are nearly level. The surface layer is dark grayish brown loam. The upper part of the subsoil is brown, friable loam; the next part is yellowish brown clay loam; and the lower part is light yellowish brown, calcareous clay loam. Calcareous sand and gravel are at a depth of 24 inches.

Minor in this map unit are the well drained and moderately well drained Belfield, Daglum, and Rhoades soils in swales and low areas on terraces; the moderately well drained Lohler soils and well drained Trembles soils on bottom land; the somewhat excessively drained Manning soils, which are near the Stady soils on the higher terraces; the well drained Savage soils on terraces; and the excessively drained Wabek soils on terrace fronts. The Belfield, Daglum, and Rhoades soils have a claypan subsoil and contain sodium.

The major soils are medium in fertility. Available water capacity is low in the Stady soils, which are droughty. It is moderate or high in the Shambo and Farnuf soils. Permeability is generally moderate in the Shambo and Farnuf soils but is moderately rapid in the lower part of the Shambo soils in channeled areas. It is moderate in the upper part of Stady soils and rapid in the underlying sand and gravel. Runoff is slow.

If carefully managed, most areas of this map unit are suited to crops, tame pasture and hayland, and windbreaks and environmental plantings. The channeled Shambo soils are best suited to range.

Flooding in the channeled areas of Shambo soils, the moderate shrink-swell potential, low strength, and potential frost action are the main concerns in managing this map unit for engineering uses. Roads should be graded above expected flood levels. The higher levels of the map unit are the best sites for buildings and waste disposal systems. The Belfield, Daglum, and Rhoades soils are the best sites for sewage lagoons. The effluent from septic tank absorption fields in the Stady soils can pollute shallow ground water. The Stady soils are a potential source of sand and gravel for construction uses. Wells and streams provide water for livestock. Except for the channeled areas of Shambo soils, this unit has potential for irrigation.

About 25 percent of the acreage of this unit is cropped. Most of the cropland is used for feed and forage crops for livestock. About 75 percent of the acreage is in native vegetation and is used for range and hay. The scattered native trees and shrubs along stream channels provide winter cover for livestock and wildlife. Cattle ranching is the main type of farming.

13. Trembles-Shambo-Stady

Deep, well drained, nearly level loamy soils and well drained, nearly level loamy soils that are moderately deep over sand and gravel; formed in alluvium on bottom land and terraces

This map unit is on bottom land and terraces, mainly along the Moreau River and some of its tributaries. Slopes are mostly less than 2 percent but are more sloping in narrow areas on terrace fronts between the higher and lower areas of the unit. The lower areas are dissected by stream channels and are subject to stream flooding.

This map unit makes up about 4 percent of the county. It is about 45 percent Trembles soils, 15 percent Shambo soils, 15 percent Stady soils, and 25 percent minor soils.

Trembles soils are on bottom land. They have a surface layer of grayish brown fine sandy loam. The underlying material is light brownish gray, calcareous, very friable fine sandy loam stratified with lenses of loamy fine sand and very fine sandy loam. In places these soils contain more silt and clay than the typical Trembles soils.

Shambo soils are on low terraces and bottom land slightly above Trembles soils. They have a surface layer of grayish brown and brown loam and a subsoil of brown and light brownish gray, friable loam. The underlying material is light yellowish brown, calcareous loam over grayish brown, calcareous gravelly sandy loam, which is below a depth of 42 inches. In channeled areas the underlying material contains sand within a depth of 40 inches.

Stady soils are on the higher terraces. They have a surface layer of dark grayish brown loam. The upper part of the subsoil is brown, friable loam; the next part is yellowish brown clay loam; and the lower part is light yellowish brown, calcareous clay loam. Calcareous sand and gravel are at a depth of 24 inches.

Minor in this map unit are the moderately well drained and well drained Absher and Loburn soils in swales and low areas on terraces; the well drained Farnuf and Savage soils on some of the terraces; the moderately well drained clayey Lohler soils on bottom land; the somewhat excessively drained Manning soils near Stady soils on the higher terraces; and the excessively drained Wabek soils on terrace fronts. Absher and Loburn soils have a claypan subsoil and contain sodium.

Trembles soils are low in fertility, and Shambo and Stady soils are medium in fertility. Available water capacity is moderate to high in the Trembles and Shambo soils and low in the Stady soils, which are droughty. Permeability is moderately rapid in the Trembles soils and is moderate in the upper part of the Shambo soils and moderately rapid in the lower part. It is moderate in the upper part of the Stady soils and rapid in the underlying sand and gravel.

Most areas of this map unit are suited to crops, tame pasture and hayland, and windbreaks and environmental plantings. The channeled areas of Shambo and Trembles soils are best suited to range.

Flooding is the main concern in managing the Trembles soils and the channeled areas of Shambo soils for engineering uses. Roads should be graded above expected flood levels. The moderate shrink-swell potential and low strength are the main limitations to engineering uses of the Shambo soils that are not subject to flooding. The Stady soils have only slight limitations for most engineering uses. The higher areas of the map unit are the best sites for buildings and waste disposal systems. The best sites for sewage lagoons are the minor soils, such as Absher and Loburn soils. The effluent from septic tank absorption fields in Stady soils can pollute shallow ground water. The Stady soils are a potential source of sand and gravel for construction uses. Wells and streams provide water for livestock. Except for the channeled areas of Trembles and Shambo soils, this map unit has potential for irrigation.

About 25 percent of the acreage of this unit is cropped. Much of the cropland is used for feed and forage crops for livestock. About 75 percent of the acreage is in native vegetation and is used for range and hay. The scattered native trees and shrubs along stream channels provide winter cover for livestock and wildlife. A number of ranch headquarters are on this map unit. Cattle ranching and sheep ranching are the main enterprises.

Broad land-use considerations

The soils in Perkins County differ widely in their potential for major land uses. The potential of each map unit on the general soil map for each major land use is described in the following paragraphs. The kinds of soil limitations are also indicated. The ratings of soil potential reflect the relative cost of common management practices and the hazard of continuing soil related limitations after such practices are installed.

Approximately 24 percent of the acreage in the county is used for cultivated crops or for tame pasture and hayland. The main cultivated crops are spring wheat, oats, winter wheat, and corn. Scattered areas throughout the county are cropped, but most of the cropland is in map units 3, 4, 5, 6, and 7. Much of the acreage in wheat is concentrated in map units 4 and 5. Most of the major soils in map units 3, 4, 5, 6, and 7 have good or fair potential for dryland farming. Lantry, Morton, Reeder, and Regent soils are the most extensively cultivated soils in these map units. Reeder soils are the most extensively cultivated soils in map units 1, 2, and 8; Marmarth soils in map units 6 and 9; and Farnuf, Shambo, Stady, and Trembles soils in map units 10, 11, 12, and 13.

The periodic shortage of moisture common to the climate is a major limitation for crops on all soils in the county. Erosion is a moderate to severe hazard on soils that have slopes of 2 percent or more. The hazard of soil blowing is slight to moderate on most of the soils and is severe on some of the minor soils that have a fine sandy loam or sandy loam surface layer.

A substantial acreage of potential cropland in this county is used for alfalfa and tame grasses. The acreage in alfalfa is used as hayland. The acreage seeded to tame grasses is used as both tame pasture and hayland. Map units 3, 4, 5, 6, 7, 10, 11, 12, and 13 have good or fair potential for tame pasture and hayland.

The availability of suitable water limits the potential for irrigation in this county. Map units 10, 11, 12, and 13 have fair to good potential for irrigation. Farnuf, Shambo, Stady, and Trembles soils are the dominant soils having fair to good potential for irrigation.

About 75 percent of the acreage is in native grass and is used for range and wild hay. Scattered areas of rangeland are throughout the county, but the largest acreage is in map units 1, 2, 8, and 9. Many of the soils in these map units are too steep or too shallow for cultivated crops or have a sodium-affected subsoil that limits their suitability for crops. Almost all of the soils in the county have fair to good potential for range. Absher, Rhoades, and Wabek soils are the only soils that have poor potential for range, but they generally are better suited to range than to other uses.

About 6,300 acres is native woodland. Most of the native trees and shrubs are in scattered areas along streams and drainageways on map units 10, 11, 12, and 13. They are valuable mainly for wildlife habitat, but they also provide protection for livestock in winter and enhance the environment. Windbreaks are planted to provide protection for farmsteads and feedlots in winter and to control soil blowing. Most of the major soils in map units 3, 4, 5, 6, 7, 10, 11, 12, and 13 have fair to good potential for windbreaks and environmental plantings.

Most of the soils in the county have fair to good potential for rangeland wildlife habitat. Most of the major soils in map units 3, 4, 5, 6, 7, 10, 11, 12, and 13 have fair to good potential for openland wildlife habitat.

The potential for recreation uses ranges from poor to good, depending on the intensity of the expected use. The nearly level Morton soils in map unit 5 and the Farnuf, Shambo, and Stady soils in map units 10, 11, 12, and 13 have good potential for intensive recreational development, such as camp areas and playgrounds. As a result of the flood hazard, parts of map units 10, 11, 12, and 13 have poor potential for intensive recreation uses. The strongly sloping to steep slopes in map units 1, 2, 3, 8, and 9 limit the potential of many of the soils for intensive recreation uses. Many of the soils in all of the map units, however, are suitable for extensive recreation uses, such as hiking or horseback riding. All of the map units have small areas where the potential for intensive recreational development is fair to good. The reservoir formed by Shadehill Dam, a popular recreation facility, provides boating and fishing.

About 1 percent of the acreage is built-up areas. The towns of Bison and Lemmon, rural stores, and farmsteads are in these areas. Soils on bottom land, such as those in map units 10, 11, 12, and 13, have poor potential as sites for buildings, roads, and waste disposal systems because of flooding. The steeper parts of map units 1, 2, 8, and 9 have poor potential for these uses because of slope and shallowness to bedrock. The major soils in map units 2, 3, 4, 5, 6, 7, 8, and 9 are limited as sites for buildings and roads by a moderate to high shrink-swell potential and by low strength. Suitable sites for houses and other small buildings, however, generally are available in other areas of these map units.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have a profile that is almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. The Zeona series, for example, was named for the post office of Zeona in Perkins County.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Morton loam, 0 to 2 percent slopes, is one of several phases within the Morton series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes, soil associations, and undifferentiated groups.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Regent-Daglum complex, 2 to 6 percent slopes, is an example.

A *soil association* is made up of soils that are geographically associated and are shown as one unit on the map because it is not practical to separate them. A soil association has considerable regularity in geographic pattern and in the kinds of soil that are a part of it. The extent of the soils can differ appreciably from one delineation to another; nevertheless, interpretations can be made for use and management of the soils. Twilight-Marmarth-Parchin association, gently rolling, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because there is little value in separating them. The pattern and proportion of the soils are not uniform. An area shown on the map has at least one of the dominant (named) soils or may have all of them. Dimmick and Heil soils is an undifferentiated group in this survey area.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Badland is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 4, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Because of changes in the application of the soil classification system, the names of some map units on the detailed soil maps do not fully agree with those in the published survey of adjacent Butte County.

AaB—Absher-Loburn loams, 0 to 9 percent slopes. This map unit consists of deep, moderately well drained and well drained, nearly level to moderately sloping soils that have a claypan subsoil. These soils are on terraces, upland flats, and foot slopes and in valleys. Slopes generally are less than 4 percent but are as much as 9 percent in some areas. The surface is uneven because small mounds rise 4 to 10 inches above intervening low spots. Individual areas range from 15 to about 300 acres in size. They are about 60 percent Absher soil and 30 percent Loburn soil. The Absher soil is in low areas, and the Loburn soil is on mounds. The two soils are so closely intermingled that it is not practical to separate them in mapping.

Typically, the Absher soil has a surface layer of light brownish gray loam about 2 inches thick. The subsoil is about 19 inches thick. It is dark gray, firm clay loam in the upper part; grayish brown, firm clay in the next part; and pale olive, calcareous clay loam in the lower part. The lower part has spots and streaks of gypsum and other salts. The underlying material to a depth of 50 inches is light olive gray, calcareous clay loam. Below 50 inches, it is gray, calcareous clay.

Typically, the Loburn soil has a surface layer of grayish brown loam about 5 inches thick. The subsurface layer is light gray silt loam about 4 inches thick. The subsoil is about 36 inches thick. It is light brownish gray, firm clay in the upper part; gray, calcareous, firm clay in the next part; and light olive gray, calcareous, firm silty clay in the lower part. Spots and streaks of gypsum are in the lower part and extend into the underlying material. The underlying material to a depth of 60 inches is grayish brown, calcareous clay. In places, the surface layer is fine sandy loam and the subsoil contains less clay than that of the Loburn soil.

Included with these soils in mapping are small areas of Marmarth soils and Slickspots, which make up about 10 percent of the unit. Marmarth soils have a smooth surface and contain less clay and sodium in the subsoil than the Loburn soil. Slickspots are in some of the low spots. They have salts at or near the surface.

The soils in this unit are low in fertility and moderately low in content of organic matter. Tilth is poor. The sodium and other salts in the subsoil and underlying material affect the availability of plant nutrients. Available water capacity is moderate. Permeability is very slow, and the claypan subsoil releases moisture slowly to plants and restricts roots. Both soils shrink and swell markedly upon drying and wetting. Runoff is slow to rapid, depending on the slope.

Most areas remain in native grass and are used for range. These soils have poor to fair potential for range and poor potential for crops, tame pasture, windbreaks and environmental plantings, wildlife habitat, recreation uses, and most engineering uses.

These soils are best suited to range. The natural plant cover is a mixture of mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses are replaced by less productive short grasses and undesirable plants. Under these conditions, a considerable amount of bare ground is evident on the Absher soil. Proper grazing use and deferred grazing help maintain or improve the range condition. Range seeding helps restore the plant cover in areas where the range condition is poor or the soil has been disturbed.

Nearly level areas of the Loburn soil can be used for crops and tame pasture, but the Absher soil is not suitable for cultivation. In most areas the two soils are so intermingled that farming this unit is not feasible. Range seeding is the preferred method of establishing plant cover in cultivated or disturbed areas.

The Absher soil is not suited to windbreaks. Nearly level areas of the Loburn soil can be used for windbreaks, but the choice of trees and shrubs is limited and the attainable height is less than optimum.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. A sewage lagoon is a suitable method of waste disposal. Increasing the size of the absorption area helps to overcome the slow absorption of liquid waste in septic tank filter fields.

Local roads should be graded to shed water. These soils lack sufficient strength and stability to support vehicular traffic, but this limitation can be overcome by strengthening or replacing the base material. Capability unit VIs-3; Absher soil in Thin Claypan range site, Loburn soil in Claypan range site.

AbC—Absher-Slickspots complex, 0 to 15 percent slopes. This map unit consists of deep, moderately well drained and well drained, nearly level to strongly sloping soils that are intermingled with Slickspots. It is on terraces and uplands. The soils have a claypan subsoil. Slopes are dominantly less than 6 percent but are as much as 15 percent in some areas. The surface is uneven because low mounds rise a few inches above intervening low spots. Areas are irregularly shaped and range from 30 to about 400 acres in size. They are about 60 percent Absher soil and 15 to 35 percent Slickspots. The Slickspots are in slightly depressed low spots. The Absher soil and the Slickspots are so closely intermingled that it is not practical to separate them in mapping.

Typically, the Absher soil has a surface layer of light brownish gray loam about 2 inches thick. The subsoil is about 19 inches thick. It is dark gray, firm clay loam in the upper part; grayish brown, firm clay in the next part; and pale olive, calcareous clay loam in the lower part. The lower part has spots and streaks of gypsum and other salts. To a depth of 50 inches, the underlying material is light olive gray, calcareous clay loam. Below 50 inches, it is gray, calcareous clay. In places, the surface layer is fine sandy loam and the subsoil contains less clay than that of the Absher soil. In some areas the surface layer is more than 4 inches thick.

Slickspots have a light gray surface crust over massive clay or clay loam. They have visible salts at or near the surface.

Included in this unit in mapping are small areas of Blackhall, Cabbart, Marmarth, and Twilight soils, which make up 5 to 25 percent of the unit. Blackhill and Cabbart soils are on the tops and upper sides of the ridges on the higher parts of the landscape. They are shallow over bedrock. Marmarth and Twilight soils also are on the higher parts of the landscape. They are moderately deep over bedrock. These included soils contain less sodium than the Absher soil.

The Absher soil is low in fertility and moderately low in content of organic matter. Tilth is poor. The sodium and other salts in the subsoil and underlying material affect the availability of plant nutrients. Available water capacity is moderate. Permeability is very slow, and the claypan subsoil releases moisture slowly to plants and restricts roots. Tilth is very poor and permeability very slow in the Slickspots. The Absher soil shrinks and swells markedly upon drying and wetting. Runoff is slow to rapid, depending on the slope.

Most areas remain in native grass and are used for range. This unit has poor potential for crops, tame pasture, range, windbreaks and environmental plantings, wildlife habitat, recreation uses, and most engineering uses.

This unit is best suited to range. The natural plant cover is a mixture of mid and short grasses on the Absher soil, but little or no vegetation grows on the Slickspots. Management that maintains an adequate plant cover and ground mulch on the Absher soil helps prevent excessive soil losses and improves the moisture supply for range plants. If the range is overgrazed, the mid grasses are replaced by less productive short grasses and undesirable plants and the amount of bare ground generally increases. Proper grazing use and deferred grazing help maintain or improve the range condition. Range seeding is difficult because of the Slickspots.

This unit is not suited to cultivated crops, tame pasture, and windbreaks. Range seeding is the preferred method of establishing a plant cover in disturbed areas. Suited trees and shrubs can be planted on the Absher soil for special purposes if they are given special care, but growth and survival are poor.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Sewage lagoons can be installed in areas where slopes are less than 7 percent, but the slow absorption of liquid waste in septic tank filter fields is difficult to overcome.

Local roads should be graded to shed water, and suitable base material should be hauled in to satisfactorily support vehicular traffic. Absher soil in capability unit VIs-3, Thin Claypan range site; Slickspots in capability unit VIIIs-3, not assigned to a range site.

Ac—Absher-Trembles-Slickspots complex, channeled. This map unit consists of deep, well drained and moderately well drained soils and Slickspots on low terraces and bottom land in narrow valleys along drainageways. It is subject to flooding in some years, especially in the areas of Trembles soil. Slopes range from 0 to 6 percent. Areas are long and narrow and generally are dissected by shallow drainageways about 3 feet deep and 6 feet wide. They range from 20 to about 200 acres in size. They are about 50 percent Absher soil, 20 percent Trembles soil, and 15 percent Slickspots.

The Absher soil and Slickspots are on low terraces and are very closely intermingled. The Trembles soil occurs as narrow strips on bottom land along drainageways. The two soils and the Slickspots are so closely intermingled that it is not practical to separate them in mapping.

Typically, the Absher soil has a surface layer of light brownish gray loam about 2 inches thick. The subsoil is about 19 inches thick. It is dark gray, firm clay loam in the upper part; grayish brown, firm clay in the next part; and pale olive, calcareous clay loam in the lower part. The lower part has spots and streaks of gypsum and other salts. To a depth of 50 inches, the underlying material is light olive gray, calcareous clay loam. Below 50 inches, it is gray, calcareous clay. In places, the surface layer is fine sandy loam and the subsoil contains less clay than that of the Absher soil. In some areas the surface layer is more than 4 inches thick.

Typically, the Trembles soil has a surface layer of grayish brown fine sandy loam about 6 inches thick. The underlying material to a depth of 60 inches is light brownish gray, calcareous, very friable fine sandy loam. It is stratified with lenses of loamy fine sand and very fine sandy loam in the upper part. In places the soil is a loam that contains more clay than the Trembles soil.

Slickspots have a light gray surface crust over massive clay or clay loam. They have visible salts at or near the surface.

Included in this unit in mapping are small areas of Cabba, Lohler, Morton, and Shambo soils and Fluvaquents, saline. These included areas make up about 15 percent of the unit. The shallow Cabba soils and the moderately deep Morton soils are on the sides of narrow valleys. The Fluvaquents are in low, wet spots and have salts at or near the surface. The clayey Lohler soils are intermingled with the Trembles soil in some areas. The Shambo soils are on some of the low terraces. They have a texture of loam and are deeper to carbonates than the Trembles soil.

The soils in this unit are low in fertility and moderately low or low in content of organic matter. Available water capacity is moderate in the Absher and Trembles soils. Tilth is poor in the Absher soil. This soil takes in water very slowly, and the claypan subsoil releases moisture slowly to plants and restricts roots. Permeability is moderately rapid in the Trembles soil. The Absher soil shrinks and swells markedly upon drying and wetting. Runoff is slow to medium.

Almost all areas remain in native vegetation and are used for range. This unit has poor potential for crops, windbreaks and environmental plantings, and most engineering uses. The Absher soil has poor potential for tame pasture, range, wildlife habitat, and recreation uses. The Trembles soil has fair potential for tame pasture and hayland and for rangeland wildlife habitat, good potential for range, and fair to good potential for recreation uses.

This unit is best suited to range. The natural plant cover is a mixture of mid and short grasses on the Absher soil and a mixture of tall and mid grasses on the Trembles soil. In some places along channels, scattered native trees and shrubs grow on the Trembles soil. Little or no vegetation grows on the Slickspots. If the range is overgrazed, the taller, more desirable grasses are replaced by less productive short grasses and undesirable plants. Under these conditions, a considerable amount of bare ground is evident on the Absher soil and the Slickspots. Proper grazing use and deferred grazing help maintain or improve the range condition.

This unit is not suited to crops, tame pasture, and windbreaks. The Trembles soil normally is suited to these uses, but in this unit it occurs as small areas that are dissected by meandering channels. As a result, farming is not practical. In places the Trembles soil can be used for gardens, tame pasture plantings, and special plantings of trees and shrubs.

This unit is poorly suited as a site for buildings. The Trembles soil is not suited as a site for buildings because of flooding. If buildings are constructed on the Absher soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Sewage lagoons can be constructed on the Absher soil, but this unit generally is not suited to septic tank filter fields because of the flooding on the Trembles soil and the slow absorption of liquid waste in the areas of Absher soil and Slickspots.

Local roads should be graded above expected flood levels. Low strength limits the ability of the Absher soil to support vehicular traffic, but this limitation can be overcome by strengthening or replacing the base material. Absher soil in capability unit VIs-3, Thin Claypan range site; Trembles soil in capability unit VIw-1, Overflow range site; Slickspots in capability unit VIIIs-3, not assigned to a range site.

AdD—Amor-Cabba loams, 6 to 15 percent slopes. This map unit consists of moderately deep and shallow, well drained, moderately sloping to strongly sloping soils on uplands. Areas are irregularly shaped and range from 20 to about 800 acres in size. They are about 55 to 70 percent Amor soil and 15 to 30 percent Cabba soil. The Amor soil is on the mid and lower parts of the landscape. The Cabba soil is on the tops and upper sides of ridges and knolls. The two soils are so closely intermingled that it is not practical to separate them in mapping.

Typically, the Amor soil has a surface layer of dark grayish brown loam about 8 inches thick. The subsoil is about 17 inches of friable loam. It is brown in the upper part and light brownish gray in the lower part. The lower part is calcareous and has spots and streaks of lime that extend into the underlying material. The underlying material to a depth of 34 inches is light yellowish brown, calcareous loam. Soft, loamy siltstone is at a depth of 34 inches. In places the subsoil is clay loam and contains more clay than that of the Amor soil. In some areas the soil is a fine sandy loam that contains less clay than the Amor soil.

Typically, the Cabba soil has a surface layer of grayish brown loam about 3 inches thick. The underlying material to a depth of 14 inches is light brownish gray, calcareous, friable silt loam. Soft siltstone is at a depth of 14 inches. In places the depth to siltstone is more than 20 inches. In some areas the soil is a loamy very fine sand.

Included with these soils in mapping are small areas of Arnegard, Belfield, Regent, and Rhoades soils, which make up about 15 percent of the unit. The deep Arnegard soils are in swales. The deep Belfield and Rhoades soils are on foot slopes and in swales. They have a clayey subsoil and contain more sodium than the Amor soil. The Regent soils are on the middle part of the landscape. They contain more silt and clay than the Amor soil.

The Amor soil is medium in fertility and moderate in content of organic matter. The Cabba soil is low in fertility and in organic-matter content. Available water capacity is low or moderate in the Amor soil and very low in the Cabba soil. Permeability is moderate in both soils. The shrink-swell potential is moderate. Runoff is rapid.

Most of the acreage remains in native grass and is used for range and hay. About 25 percent is used for crops and tame pasture and hay. These soils have fair to poor potential for crops, tame pasture and hay, and most engineering uses and good to fair potential for range, rangeland wildlife habitat, and most recreation uses. The Amor soil has good potential and the Cabba soil poor potential for windbreaks and environmental plantings.

These soils are well suited to range. The natural plant cover is a mixture of mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps to prevent excessive soil losses and improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition. Range seeding helps restore plant cover in areas where the range condition is poor or the soil has been disturbed.

The Amor soil is suited to small grain, alfalfa, and tame grasses, but the Cabba soil is not suited to farming because of low fertility and a very severe erosion hazard. Controlling erosion and soil blowing is the main concern if this unit is farmed. Stubble mulch, crop residue management, close-sown crops, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and soil blowing and conserve moisture. Returning crop residue to the soil helps maintain fertility and tilth.

Seeding cultivated areas to tame pasture is an effective way of controlling erosion and soil blowing. All climatically suited pasture plants grow well on the Amor soil. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established. Range seeding is the preferred method of establishing a grass cover in cultivated areas where the Cabba soil is significant in extent.

Windbreaks can be planted on the Amor soil. A year of fallow prior to planting helps to eliminate grass and weeds and conserves moisture. Planting the trees and shrubs on the contour helps control erosion and conserves moisture.

If buildings are constructed on these soils, properly designing foundations and footings and diverting water away from the buildings help to prevent the structure damage caused by shrinking and swelling. Enlarging the absorption area helps to overcome the slow absorption of liquid waste and the moderate depth to bedrock in septic tank filter fields on the Amor soil and the included soils on the lower part of the landscape. Sewage lagoons can be constructed on the lower part of the landscape. Sealing the sides and bottom of the lagoon helps prevent excessive seepage.

Local roads should be graded to shed water, and the base material should be strengthened to support vehicular traffic. Roadside erosion-control measures are needed in the borrow areas along graded roads. Amor soil in capability unit IVe-1, Silty range site; Cabba soil in capability unit VIe-11, Shallow range site.

Ar—Arnegard loam. This deep, moderately well drained, nearly level soil is in swales on uplands and terraces. Most areas receive runoff from adjacent soils, but the flooding is of brief duration and generally the moisture is beneficial. Areas are long and narrow and range from 10 to about 50 acres in size. Slopes are concave. They generally are less than 2 percent but are as much as 4 percent in some included areas.

Typically, the surface layer is grayish brown loam about 11 inches thick. The subsoil is about 29 inches of grayish brown, friable loam. The lower part is calcareous and has spots of lime that extend into the underlying material. To a depth of 46 inches, the underlying material is light brownish gray, calcareous loam. Below 46 inches, it is grayish brown, calcareous fine sandy loam.

Included with this soil in mapping are small areas of Belfield and Morton soils, which make up less than 10 percent of the unit. The Belfield soil is along small drainageways in some areas. It has a more clayey subsoil than the Arnegard soil and contains more sodium. The moderately deep Morton soil is on the edge of some areas.

This Arnegard soil is high in fertility and organic-matter content. Tilth is good. Permeability is moderate, and available water capacity is high. The water table is at a depth of 3 to 6 feet early in the growing season in some years. The shrink-swell potential is moderate. Runoff is slow.

Most areas are farmed. This soil has good potential for crops, tame pasture and hayland, range, windbreaks and environmental plantings, and openland wildlife habitat; fair to poor potential for recreation uses; and poor potential for most engineering uses.

This soil is well suited to corn, small grain, alfalfa, and tame grasses. A shortage of moisture during dry years is the main limitation if the soil is cropped. Spring planting is delayed in some years, but in most years the runoff that accumulates on the soil is beneficial. The hazards of erosion and soil blowing are slight. Stubble mulch and crop residue management help conserve moisture and control erosion and soil blowing. Grassed waterways help prevent gullying. Returning crop residue to the soil helps maintain fertility and tilth.

All climatically suited pasture plants grow well on this soil. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is a mixture of tall and mid grasses. If the range is overgrazed, the tall grasses lose vigor and are replaced by less productive mid and short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

This soil is well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well because of the favorable moisture regime. A year of fallow prior to planting helps eliminate grasses and weeds and conserves moisture.

This soil is poorly suited as a site for buildings because of the flood hazard. Properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Because of the flood hazard, this soil is not suitable as a site for septic tank filter fields. Excessive seepage from sewage lagoons and farm ponds can be prevented by sealing the bottom and sides of the lagoons and the reservoir area of the ponds.

Local roads should be graded above expected flood levels. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Capability unit IIc-3; Overflow range site.

Ba—Badland. This map unit consists mainly of eroding exposures of shale, siltstone, and sandstone around the head of drainageways on the sides of ridges and buttes (fig. 4). Slopes range from nearly level on hilltops to very steep on the sides of entrenched drainageways. Areas are irregularly shaped and range from 10 to 150 acres or more in size. They are about 75 to 90 percent Badland.

Included with this unit in mapping are small, grass-covered areas, which make up 10 to 25 percent of the unit. These are areas mainly of the shallow Blackhall, Cabba, Cabbart, Cohagen, and Wayden soils on the tops and vegetated sides of ridges and buttes.

This map unit has poor potential for most uses. The Badland is bare or nearly bare of vegetation. Scattered annuals and forbs provide some browse for wildlife. In some areas the included soils provide grazing for livestock, but many of these small areas are inaccessible and available sites for livestock water are scarce. Capability unit VIIIs-2; not assigned to a range site.

Bb—Banks loamy fine sand. This deep, nearly level to gently undulating, excessively drained or somewhat excessively drained soil is on bottom land. Areas are long and irregularly shaped and range from 15 to 1,000 acres in size. Slopes are mostly less than 2 percent, but the surface commonly is uneven because of low ridges and swales formed by flood water or hummocks and hollows formed by soil blowing. Sand blowouts are in the hummocky parts of some areas.

Typically, the surface layer is light brownish gray, calcareous loamy fine sand about 6 inches thick. The underlying material to a depth of 24 inches is light gray, calcareous, very friable sandy loam and light brownish gray, calcareous, loose loamy fine sand. Below this to a depth of 60 inches is light gray, calcareous fine sand. Recent deposits of gravelly sand are near the stream channel in some areas. In places the content of sand is lower than that of the Banks soil.

This soil is low in fertility and in content of organic matter. Available water capacity is low. Permeability is rapid, and runoff is slow. In some years the water table is at a depth of 4 to 6 feet early in the growing season.

Most areas remain in native vegetation and are used for range. This soil has good potential for range; fair potential for rangeland wildlife habitat; and poor potential for crops, tame pasture and hay, windbreaks and environmental plantings, and most recreation and engineering uses.

This soil is best suited to range. The natural plant cover is a mixture of tall, mid, and short grasses. Scattered native trees and shrubs in some areas provide winter protection for wildlife and livestock. Management that maintains an adequate grass cover and ground mulch helps control soil blowing and improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses and undesirable plants. Under these conditions, sand blowouts form. Proper grazing use and deferred grazing help maintain or improve the range condition.

If dryfarmed, this soil is not suited to crops or to tame pasture and hayland because of a severe soil blowing hazard, low fertility, and droughtiness. Crops and tame pasture plants can be grown successfully if the soil is irrigated. Crop residue management and wind stripcropping help control soil blowing. Green manure crops and applications of animal manure and chemical fertilizer improve fertility and increase the content of organic matter. In irrigated areas alfalfa and tame grasses generally are better suited than annual crops.

This soil is poorly suited to windbreaks and environmental plantings. Windbreaks can be established if extra water is provided and the trees are scalp planted to control soil blowing.

This soil is poorly suited as a site for buildings and waste disposal systems because of the flood hazard. Buildings and septic tank filter fields can be constructed on this soil if the sites are adequately protected from floodwater. The effluent from septic tank filter fields, however, can pollute shallow ground water. Local roads should be graded above expected flood levels. Capability unit VIe-8; Sands range site.

BcA—Belfield-Grail silt loams, 0 to 2 percent slopes. This map unit consists of deep, well drained and moderately well drained, nearly level soils in swales and broad valleys on uplands. Slopes are plane to slightly concave. Areas are irregularly shaped. They are about 55 percent Belfield soil and 35 percent Grail soil. The Belfield soil is on very slight rises. The moderately well drained Grail soil generally is on the lower parts of the landscape and commonly receives runoff from adjacent soils. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Belfield soil has a surface layer of dark grayish brown silt loam about 10 inches thick. Next is a 2-inch transitional layer of grayish brown silty clay and light brownish gray silt loam. The subsoil is about 27 inches of grayish brown, firm and very firm silty clay. It is calcareous in the lower part. To a depth of 50 inches, the underlying material is grayish brown, calcareous clay loam. Below this to a depth of 60 inches, it is light olive brown, calcareous sandy clay loam. In places, the subsoil is thinner and the depth to sodium and other salts is less than is typical for Belfield soils.

Typically, the Grail soil has a surface layer of dark grayish brown silt loam about 9 inches thick. The subsoil is about 33 inches thick. It is grayish brown, firm silty clay loam in the upper part; grayish brown silty clay in the next part; and light brownish gray, calcareous silty clay loam in the lower part. The underlying material to a depth of 60 inches is light brownish gray, calcareous silty clay loam.

Included with these soils in mapping are small areas of Farnuf, Morton, Regent, Rhoades, and Shambo soils, which make up about 10 percent of the unit. Farnuf, Morton, and Shambo soils contain less clay in the subsoil than the Belfield soil. They are on slight rises on the edge of the unit. The moderately deep Regent soils also are on slight rises on the edge of the unit. Rhoades soils have a surface layer that is less than 5 inches thick and are shallower to sodium and other salts than the Belfield soil. They are closely intermingled with the Belfield soil.

The Belfield and Grail soils are medium to high in fertility and moderate to high in content of organic matter. Available water capacity is high, but the clayey subsoil releases moisture slowly to plants. Permeability is moderately slow through the subsoil in both soils and is moderately slow or slow in the underlying material. Both soils shrink and swell markedly upon drying and wetting. Runoff is slow. The Grail soil has a seasonal water table at a depth of 3 to 6 feet early in the growing season.

Many areas are farmed. These soils have good potential for crops, tame pasture and hayland, and range; fair to good potential for windbreaks and environmental plantings and for openland and rangeland wildlife habitat; fair to poor potential for recreation uses; and poor potential for most engineering uses.

These soils are suited to corn, small grain, alfalfa, and tame grasses. Wetness delays spring planting on the Grail soil in some years, but in most years the shortage of moisture common to the climate is the main concern in managing cropped areas. Stubble mulch, crop residue management, and minimum tillage help conserve moisture and control soil blowing. Chiseling or subsoiling improves water intake. Returning crop residue to the soils helps maintain fertility and tilth.

These soils are well suited to tame pasture and hayland. All climatically suited tame pasture plants grow well. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

These soils are well suited to range. The natural plant cover is a mixture of tall, mid, and short grasses. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

The Grail soil is well suited and the Belfield soil moderately well suited to windbreaks and environmental plantings of adapted trees and shrubs. A year of fallow prior to planting helps eliminate grass and weeds and conserves moisture.

The Grail soil is not suited as a building site unless it is protected against flooding and drained. If buildings are constructed on these soils, properly designing foundations and footings and diverting water away from the buildings helps to prevent the structure damage caused by shrinking and swelling. The soils have slight limitations for sewage lagoons. Septic tank filter fields can be constructed in the Belfield soil, but the absorption area should be enlarged to overcome the slow absorption of liquid waste.

Local roads and streets should be graded to shed water. Low strength limits the ability of the Belfield soil to support vehicular traffic, but strengthening or replacing the base material helps to overcome this limitation.

Belfield soil in capability unit IIIs-1, Clayey range site; Grail soil in capability unit IIc-3, Overflow range site.

BdB—Belfield-Marmarth complex, 0 to 6 percent slopes. This map unit consists of deep and moderately deep, well drained, nearly level and gently sloping soils on uplands, typically on foot slopes below ridges and in broad swales. Individual areas are irregular in shape and range from 10 to about 100 acres in size. They are about 55 percent Belfield soil and 30 percent Marmarth soil. Typically, the Belfield soil is on the mid and lower parts of the landscape and the Marmarth soil is on the higher parts. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Belfield soil has a surface layer of dark grayish brown silt loam about 10 inches thick. Next is a 2-inch transitional layer of grayish brown silty clay and light brownish gray silt loam. The subsoil is about 27 inches of grayish brown, firm and very firm silty clay. It is calcareous in the lower part. To a depth of 50 inches, the underlying material is grayish brown, calcareous clay loam. Below this to a depth of 60 inches, it is light olive brown, calcareous sandy clay loam. In places, the subsoil is thinner and the depth to sodium and other salts is less than is typical for Belfield soils. In some areas soft siltstone or sandstone is as shallow as 36 inches.

Typically, the Marmarth soil has a surface layer of dark grayish brown loam about 7 inches thick. The subsoil is about 8 inches of grayish brown, friable heavy loam. The underlying material to a depth of 25 inches is light gray, calcareous loam. Light gray and yellow, soft sandstone is at a depth of 25 inches. It is calcareous in the upper part.

Included with these soils in mapping are small areas of Absher and Twilight soils and Slickspots. These included areas make up about 15 percent of the unit. Absher soils have a surface layer that is less than 5 inches thick over a claypan subsoil and are shallower to visible accumulations of salts than the Belfield soil. Salts are at or near the surface in the areas of Slickspots. Absher soils and Slickspots are intermingled with the Belfield soil on the lower part of the landscape. Twilight soils contain more sand than the Marmarth soil. They are on the higher parts of the landscape.

The Belfield and Marmarth soils are medium in fertility and moderate in content of organic matter. Available water capacity is high in the Belfield soil, but the clayey subsoil releases moisture slowly to plants. Available water capacity is low in the Marmarth soil, and the root zone is limited by the moderate depth to sandstone. Permeability is moderately slow or slow in the Belfield soil and moderate in the Marmarth soil. The shrink-swell potential is high in the Belfield soil and moderate in the Marmarth soil. Runoff is slow to medium.

Most areas remain in native grass and are used for range. These soils have good potential for range, rangeland wildlife habitat, and tame pasture and hayland; fair to good potential for recreation uses; fair potential for crops and for windbreaks and environmental plantings; and poor to fair potential for most engineering uses.

These soils are well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch prevents excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

These soils are suited to corn, small grain, alfalfa, and tame grasses. Controlling erosion is the main concern if the soil is cropped. Conserving moisture, controlling soil blowing, and improving water intake in the Belfield soil also are important. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and soil blowing and conserve moisture. Chiseling or subsoiling improves water intake in the Belfield soil. Returning crop residue to the soils helps maintain fertility and tilth.

Seeding these soils to tame pasture plants is an effective means of controlling erosion and soil blowing. All climatically suited pasture plants grow well. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

These soils are moderately well suited to windbreaks and environmental plantings. The attainable height is somewhat less than optimum, and the choice of trees is limited because of the clayey subsoil in the Belfield soil. A year of fallow prior to planting helps eliminate grass and weeds and conserves moisture. Planting the trees and shrubs on the contour also conserves moisture.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. The Belfield soil is a better site for septic tank filter fields and sewage lagoons because the Marmarth soil is moderately deep to bedrock. Enlarging the absorption area helps to overcome the slow absorption of liquid waste in septic tank filter fields on the Belfield soil.

Local roads and streets should be graded to shed water. Low strength limits the ability of the Belfield soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Capability unit IIIe-3; Belfield soil in Clayey range site, Marmarth soil in Silty range site.

BeC—Belfield-Morton complex, 2 to 9 percent slopes. This map unit consists of deep and moderately deep, well drained, gently sloping and moderately sloping soils on uplands. Typically, it is in a broad valley where plane to concave slopes are interrupted by convex ridges. Areas are irregularly shaped and range from 20 to about 200 acres in size. They are about 55 percent Belfield soil and 30 percent Morton soil. Generally, the Belfield soil is on the lower part of the landscape and has slopes of less than 6 percent. The Morton soil generally is on the convex ridges on the higher parts of the landscape. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Belfield soil has a surface layer of dark grayish brown silt loam about 10 inches thick. Next is a 2-inch transitional layer of grayish brown silty clay and light brownish gray silt loam. The subsoil is about 27 inches of grayish brown, firm and very firm silty clay. It is calcareous in the lower part. To a depth of 50 inches, the underlying material is grayish brown, calcareous clay loam. Below this to a depth of 60 inches, it is light olive brown, calcareous sandy clay loam. In places the subsoil and underlying material contain less sodium and other salts than is typical for Belfield soils. In some areas soft siltstone or sandstone is within a depth of 36 inches.

Typically, the Morton soil has a surface layer of brown loam about 7 inches thick. The subsoil is about 11 inches of friable silty clay loam. It is brown in the upper part and pale brown in the lower part. The lower part is calcareous. The underlying material to a depth of 32 inches is light gray and pale olive, calcareous silty clay loam that has spots and streaks of lime. Pale olive, calcareous, soft siltstone is at a depth of 32 inches.

Included with these soils in mapping are small areas of Rhoades and Vebar soils and Slickspots. These included areas make up about 15 percent of the unit. Rhoades soils have a surface layer that is less than 5 inches thick and are shallower to sodium and other salts than the Belfield soil. Rhoades soils and Slickspots are in low areas along drainageways. Slickspots have visible salts at or near the surface. Vebar soils contain more sand than the Morton soil. They are on some of the ridges on the higher parts of the landscape.

The Belfield and Morton soils are medium in fertility and moderate in content of organic matter. Available water capacity is high in the Belfield soil, but the clayey subsoil releases moisture slowly to plants. Available water capacity is moderate in the Morton soil, and the root zone is limited by the moderate depth to siltstone. Permeability is moderately slow or slow in the Belfield soil and moderate in the Morton soil. The shrink-swell potential is high in the Belfield soil and moderate in the Morton soil. Runoff is medium.

Many areas are farmed. Some remain in native grass and are used for range or hay. These soils have good potential for tame pasture and hayland, range, and rangeland wildlife habitat; fair to good potential for openland wildlife habitat and recreation uses; fair potential for crops and for windbreaks and environmental plantings; and poor to fair potential for most engineering uses.

These soils are suited to corn, small grain, alfalfa, and tame grasses. Small grain is better suited than corn in the steeper areas because of a severe erosion hazard. Controlling erosion is the main problem if the soils are cropped. Conserving moisture, controlling soil blowing, and improving water intake in the Belfield soil are other important concerns. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and soil blowing and conserve moisture. Chiseling or subsoiling improves water intake in the Belfield soil. Returning crop residue to the soils helps maintain fertility and tilth.

Seeding these soils to tame pasture plants is an effective means of controlling erosion and soil blowing. All climatically suited pasture plants grow well. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

These soils are well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

These soils are moderately well suited to windbreaks and environmental plantings. The attainable height is somewhat less than optimum, and the choice of trees is limited by the clayey subsoil in the Belfield soil. A year of fallow prior to planting helps eliminate grass and weeds and conserves moisture. Planting the trees and shrubs on the contour also conserves moisture.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. The Belfield soil is a better site for septic tank filter fields and sewage lagoons because the Morton soil is moderately deep to bedrock. Enlarging the absorption area helps to overcome the slow absorption of liquid waste in septic tank filter fields on the Belfield soil.

Local roads and streets should be graded to shed water. Low strength limits the ability of the Belfield soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Capability unit IIIe-3; Belfield soil in Clayey range site, Morton soil in Silty range site.

BfA—Belfield-Rhoades complex, 0 to 2 percent slopes. This map unit consists of deep, well drained and moderately well drained, nearly level soils in broad swales and along drainageways in the uplands. Areas are irregularly shaped and range from 15 to about 50 acres in size. They are about 65 percent Belfield soil and 20 percent Rhoades soil. The moderately well drained Rhoades soil generally is in low spots that are depressed a few inches below the level of the Belfield soil. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Belfield soil has a surface layer of dark grayish brown silt loam about 10 inches thick. Next is a 2-inch transitional layer of grayish brown silty clay and light brownish gray silt loam. The subsoil is about 27 inches of grayish brown, firm and very firm silty clay. It is calcareous in the lower part. To a depth of 50 inches, the underlying material is grayish brown, calcareous clay loam. Below this to a depth of 60 inches, it is light olive brown, calcareous sandy clay loam. In places, the subsoil is thinner and the depth to sodium and other salts is less than is typical for Belfield soils.

Typically, the Rhoades soil has a surface layer of light brownish gray loam about 4 inches thick. The subsoil is about 15 inches thick. It is grayish brown, firm clay loam in the upper part and grayish brown, firm silty clay in the lower part. The underlying material to a depth of 43 inches is light yellowish brown, calcareous silty clay loam that has spots of gypsum and other salts. Light yellowish brown, calcareous siltstone is at a depth of 43 inches.

Included with these soils in mapping are small areas of Farnuf, Shambo, Stady, Tally, and Trembles soils and Slickspots. These included areas make up about 15 percent of the unit. Farnuf, Shambo, Stady, Tally, and Trembles soils contain less clay and less sodium than the Belfield and Rhoades soils. They are along some of the larger drainageways that cross the unit. Slickspots have salts at or near the surface. They are closely intermingled with the Rhoades soil in low spots.

The Belfield soil is medium in fertility, and the Rhoades soil is low in fertility. Both soils are moderate in content of organic matter. Available water capacity is high in the Belfield soil. It is low in the Rhoades soil. This soil is in poor tilth and is difficult to work. Permeability is moderately slow or slow in the Belfield soil and very slow in the Rhoades soil. The claypan subsoil in the Rhoades soil is especially restrictive to root growth. The shrink-swell potential is high in both soils. Runoff is slow, and water tends to accumulate on the included Slickspots in low areas.

Most areas remain in native grass and are used for range. The Belfield soil has good potential for range, rangeland wildlife habitat, and tame pasture and hayland; fair to good potential for recreation uses; and fair potential for crops and for windbreaks and environmental plantings. The Rhoades soil has poor potential for all of these uses. Both soils have poor potential for most engineering uses.

Because of the limitations of the Rhoades soil, this unit is best suited to range. The natural plant cover is mainly mid and short grasses. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Under these conditions, a considerable amount of bare ground is evident on the Rhoades soil and the included Slickspots. Grazing when the soils are wet causes compaction and weakens the more desirable plants. Proper grazing use and deferred grazing help maintain or improve the range condition. Range seeding helps restore desirable range plants in areas that are in poor condition or have been disturbed.

The Belfield soil generally is suited to crops, but the Rhoades soil is not suited. As a result, the growth of cultivated crops is generally uneven. Improving water intake and tilth and conserving moisture are the main concerns if the soils are cropped. Stubble mulch, crop residue management, and minimum tillage help conserve moisture and control soil blowing. Chiseling or subsoiling improves water intake. Returning crop residue to the soil and applying animal manure improve tilth and fertility.

The Belfield soil is suited to tame pasture. In many areas, however, it is intermingled with the Rhoades soil. As a result, range seeding is the preferred method of establishing a grass cover in farmed or otherwise disturbed areas.

Environmental plantings can be established on the Belfield soil, but windbreaks generally are not feasible on this unit because trees and shrubs grow poorly on the Rhoades soil.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Sewage lagoons are a satisfactory means of waste disposal. The slow absorption of liquid waste severely limits the use of these soils as septic tank absorption fields, but this limitation generally can be overcome by enlarging the absorption area.

Local roads and streets should be graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening or replacing the base material helps to overcome this limitation. Belfield soil in capability unit IIIs-1, Clayey range site; Rhoades soil in capability unit VIs-1, Thin Claypan range site.

BhE—Blackhall-Cabbart complex, 15 to 40 percent slopes. This map unit consists of shallow, well drained to excessively drained, moderately steep and steep soils on the sides of upland ridges and deeply entrenched drainageways. Slopes are mostly 15 to 40 percent, but the escarpments in some included areas are almost vertical. Areas are irregularly shaped and range from 20 to about 200 acres in size. They are about 40 percent Blackhall soil and 40 percent Cabbart soil. The pattern of the two soils is related to differences in the underlying sandstone, and the soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Blackhall soil has a surface layer of light brownish gray fine sandy loam about 3 inches thick. The underlying material to a depth of 13 inches is light yellowish brown and light brownish gray, calcareous, very friable fine sandy loam. Pale olive, calcareous, soft sandstone is at a depth of 13 inches. On the lower parts of the landscape, the depth to sandstone is more than 20 inches.

Typically, the Cabbart soil has a surface layer of light brownish gray loam about 2 inches thick. Next is a transitional layer of grayish brown, very friable loam about 4 inches thick. The underlying material to a depth of 18 inches is light brownish gray, calcareous loam. Light brownish gray, soft sandstone is at a depth of 18 inches. On the lower parts of the landscape, the depth to sandstone is more than 20 inches.

Included with these soils in mapping are small areas of Absher, Loburn, Marmarth, Parchin, and Shambo soils and Slickspots. These included areas make up about 20 percent of the unit. Absher, Loburn, and Parchin soils are on foot slopes and fans along drainageways. They have a claypan subsoil and contain more sodium than the Blackhall and Cabbart soils. The moderately deep Marmarth soils are on some of the broader ridgetops and on the foot slopes on the lower part of the landscape. The deep Shambo soils are on narrow bottoms and terraces along the larger drainageways. Slickspots are intermingled with the Absher soil. They have salts at or near the surface. Small areas of gravelly soils are on some of the ridgetops.

The Blackhall and Cabbart soils are low in fertility and in content of organic matter. Available water capacity is very low. The root zone is limited by the shallowness to sandstone. Permeability is moderate in the Blackhall soil and moderately slow or slow in the Cabbart soil.

All areas remain in native grass and are used for range. These soils have fair potential for range and rangeland wildlife habitat and poor potential for crops, tame pasture and hayland, windbreaks and environmental plantings, and most recreation and engineering uses.

These soils are best suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

These soils are not suited to crops, tame pasture, and windbreaks because of moderately steep and steep slopes, shallowness, and a very severe erosion hazard. Environmental plantings can be made in the less steep areas, but the choice of trees and shrubs is limited and survival is poor unless supplemental water is provided.

The moderately steep and steep slopes severely limit these soils as sites for buildings. Disturbed areas should be revegetated as soon as possible to control erosion. If buildings are constructed on the Cabbart soil, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling. The included soils on the lower part of the landscape are the best sites for waste disposal systems.

Local roads and streets should be constructed in the less steep areas and graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Erosion in borrow areas can be a serious problem unless it is controlled by roadside erosion-control measures. Capability unit VIIe-3; Shallow range site.

CaE—Cabba-Lantry loams, 15 to 40 percent slopes. This map unit consists of shallow and moderately deep, well drained, moderately steep and steep soils on upland ridges and on the sides of deeply entrenched drainageways. Slopes are mostly 15 to 40 percent, but the escarpments in some included areas are almost vertical. Areas are irregularly shaped and range from 30 to about 800 acres in size. They are about 55 percent Cabba soil and 30 percent Lantry soil.

The Cabba soil is on the tops and upper sides of ridges and knolls, and the Lantry soil is on the mid and lower parts of the landscape below the Cabba soil or is on some of the less steep ridgetops. The slope of the Lantry soil generally is less than 25 percent. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Cabba soil has a surface layer of grayish brown loam about 3 inches thick. The underlying material to a depth of 14 inches is light brownish gray, calcareous, friable silt loam. Light gray, calcareous, soft sandstone is at a depth of about 14 inches (fig. 5). In some places the content of sand is higher than that of the Cabba soil. In others the soil is a silty clay loam that contains more clay than the Cabba soil.

Typically, the Lantry soil has a surface layer of grayish brown, calcareous loam about 2 inches thick. The subsoil is about 9 inches of light brownish gray, calcareous, very friable loam and silt loam. The underlying material to a depth of 26 inches is light brownish gray, calcareous silt loam that has spots and streaks of lime. Light brownish gray, calcareous, soft siltstone and sandstone are at a depth of 26 inches.

Included with these soils in mapping are small areas of Morton, Reeder, Trembles, Vebar, and Wabek soils, which make up about 15 percent of the unit. Morton, Reeder, and Vebar soils are deeper to lime than the Lantry soil. They are on broad ridgetops or on the lower part of the landscape below the Lantry soil. The deep Trembles soil is on the bottom of deeply entrenched drainageways or ravines. The gravelly Wabek soils are on some of the ridges.

The Cabba and Lantry soils are low in fertility and low or moderately low in content of organic matter. Available water capacity is very low or low. The root zone is limited because the soils are shallow and moderately deep over bedrock. Permeability is moderate. The shrink-swell potential also is moderate. Runoff is rapid.

Almost all areas remain in native grass and are used for range. These soils have fair potential for range and rangeland wildlife habitat and poor potential for crops, tame pasture and hayland, windbreaks and environmental plantings, and most recreation and engineering uses.

These soils are best suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

These soils are not suited to crops, tame pasture, and windbreaks because of the moderately steep and steep slopes, the shallowness of the Cabba soil, the low fertility, and a very severe erosion hazard. Disturbed areas of the Lantry soil can be seeded to tame pasture plants if the slope is less than 25 percent, but bunch-type species should not be seeded alone because of the very severe erosion hazard. Environmental plantings can be grown on the less steep Lantry soil or on the included soils on the mid and lower parts of the landscape.

The moderately steep and steep slopes severely limit the use of these soils as sites for buildings. Disturbed areas should be revegetated as soon as possible to control erosion. Proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling and by the unstable underlying siltstone. Waste disposal systems are severely limited by the slope and the depth to siltstone. The included soils on the lower part of the landscape are the best sites for these systems.

Local roads and streets should be constructed in the less steep areas and graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Erosion in borrow areas can be a serious problem unless it is controlled by roadside erosion-control measures. Cabba soil in capability unit VIIe-7, Shallow range site; Lantry soil in capability unit VIe-3, Thin Upland range site.

CbD—Cabba-Trembles complex, 2 to 30 percent slopes. This map unit consists of shallow, well drained, moderately steep soils on the short, side slopes along entrenched drainageways and deep, well drained, gently sloping soils occurring as narrow strips on bottom land along drainageways. Areas are long and narrow and range from 10 to about 500 acres in size. They are about 70 percent Cabba soil and 30 percent Trembles soil. The Cabba soil is on the sides of entrenched drainageways, and the Trembles soil is on U-shaped bottoms and is subject to flooding. The two soils occur as areas that are too narrow to be separated in mapping.

Typically, the Cabba soil has a surface layer of grayish brown loam about 3 inches thick. The underlying material to a depth of 14 inches is light brownish gray, calcareous, friable silt loam. Light gray, calcareous, soft siltstone is at a depth of about 14 inches. In places the depth to soft siltstone is more than 20 inches.

Typically, the Trembles soil has a surface layer of grayish brown fine sandy loam about 6 inches thick. The lower 4 inches is calcareous. The underlying material to a depth of 60 inches is light brownish gray, calcareous, very friable fine sandy loam. In places the content of silt and clay is higher than that of the Trembles soil.

Included with these soils in mapping are small areas of Absher soils and Slickspots. These included areas make up less than 5 percent of the unit. They are on foot slopes and fans below the Cabba soil. The deep Absher soils have a claypan subsoil near the surface. Slickspots are intermingled with the Absher soils. They have salts at or near the surface.

The Cabba and Trembles soils are low in fertility and in content of organic matter. Available water capacity is very low in the Cabba soil and moderate in the Trembles soil. The root zone in the Cabba soil is limited by the shallowness to siltstone. Permeability is moderate in the Cabba soil and moderately rapid in the Trembles soil. The shrink-swell potential is moderate in the Cabba soil. Runoff is rapid on the Cabba soil, and water collects on the Trembles soil.

These soils remain in native vegetation and are used for range and hay. They have fair to good potential for range and rangeland wildlife habitat and poor potential for crops, tame pasture and hayland, windbreaks, and most recreation and engineering uses.

These soils are best suited to range. The natural plant cover is mainly mid and short grasses on the Cabba soil and tall and mid grasses on the Trembles soil. In places scattered clumps of native trees and shrubs are on the Trembles soil. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses and undesirable plants. Under these conditions, runoff from the Cabba soil increases and forms gullies in the narrow strips of Trembles soil.

These soils generally are not suited to crops, tame pasture and hayland, and windbreaks because of the steep slopes, the shallowness, and a very severe erosion hazard on the Cabba soil. The Trembles soil normally is suited to crops, but in this unit it occurs as narrow areas that can be farmed only in small garden tracts. Disturbed areas of the Trembles soil can be seeded to tame pasture plants if they are accessible to machinery. Trees and shrubs grow well as environmental plantings on the Trembles soil, but most areas of this soil are too narrow for conventional windbreaks.

The moderately steep slopes of the Cabba soil and the flood hazard on the Trembles soil severely limit building site development. If buildings are constructed on the Cabba soil, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling and by the unstable underlying siltstone. Disturbed areas should be revegetated as soon as possible to control erosion. Waste disposal systems can be constructed in the areas of Trembles soil that are protected from floodwater, but the effluent can pollute shallow ground water. Sealing the sides and bottom of sewage lagoons on the Trembles soil helps to prevent excessive seepage.

Local roads and streets should be graded to shed water and constructed above expected flood levels on the Trembles soil. Low strength limits the ability of the Cabba soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Roadside erosion-control measures are needed in borrow areas if roads are constructed on the Cabba soil. Cabba soil in capability unit VIe-11, Shallow range site; Trembles soil in capability unit VIw-1, Overflow range site.

CcD—Cabba and Wayden stony soils, 2 to 25 percent slopes. This map unit consists of shallow, well drained, gently sloping to moderately steep, stony soils on uplands. Typically, it is on the tops and upper sides of ridges where stones that are less than 1 foot to about 5 feet apart cover 15 to 90 percent of the surface. Individual areas are irregular in shape and range from 15 to about 100 acres in size. Some areas are dominantly Cabba soil, and some are dominantly Wayden soil. In the rest of the areas, the proportion of each soil varies.

Typically, the Cabba soil has a surface layer of grayish brown stony loam about 3 inches thick. The underlying material to a depth of 14 inches is light brownish gray, calcareous, friable stony silt loam. Light gray, calcareous, soft siltstone is at a depth of 14 inches. In places the depth to siltstone is slightly more than 20 inches. In some areas the soil contains more sand and less clay than is typical for Cabba soils.

Typically, the Wayden soil has a surface layer of light yellowish brown, calcareous stony silty clay loam about 2 inches thick. The underlying material to a depth of 13 inches is pale olive, calcareous, friable stony silty clay loam. Light gray, calcareous, soft shale is at a depth of 13 inches.

Included with these soils in mapping are small areas of Reeder, Regent, and Vebar soils, which make up about 10 percent of the unit. The moderately deep Reeder and Vebar soils generally are on the lower part of the landscape. They are deeper to lime than the Cabba soil. The moderately deep Regent soils generally are below the Wayden soil on the landscape. They are deeper to lime than that soil.

The Cabba and Wayden soils are low in fertility and in content of organic matter. Available water capacity is very low. The root zone is limited because the soils are shallow over bedrock. Permeability is moderate in the Cabba soil and slow in the Wayden soil. The shrink-swell potential is moderate in the Cabba soil and high in the Wayden soil. Runoff is medium to rapid.

All areas remain in native grass and are used for range. These soils have fair potential for range and rangeland wildlife habitat and poor potential for crops, tame pasture, windbreaks and environmental plantings, and most recreation and engineering uses.

These soils are best suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

These soils are not suited to crops, tame pasture and hayland, and windbreaks because they are stony, are shallow over bedrock, are low in fertility, and in some areas are moderately steep. Environmental plantings can be made in areas on the lower part of the landscape where the soil is deeper and is less likely to contain stones.

These soils are poorly suited as sites for buildings because they are stony, are shallow over bedrock, and in some areas are moderately steep. If buildings are constructed on the soils, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling and by the unstable underlying siltstone and shale. The lower parts of the landscape where the soils are deeper and less steep are the best sites for septic tank filter fields and sewage lagoons.

Local roads and streets should be graded to shed water, but the stones cause some trouble in construction. Low strength limits the ability of these soils to support vehicular traffic, but this limitation can be overcome by strengthening the base material. If the roads are constructed on the moderately steep soils, roadside erosion-control measures help to reduce the risks of erosion and soil blowing in borrow areas. Capability unit VIIs-6; Shallow range site.

CdE—Cohagen-Vebar complex, 15 to 40 percent slopes. This map unit consists of shallow and moderately deep, well drained to excessively drained, moderately steep and steep soils on uplands. Typically, it is on the tops and sides of ridges and on the sides of entrenched drainageways. Individual areas are irregular in shape and range from 30 to about 500 acres in size. They are about 50 percent Cohagen soil and 40 percent Vebar soil. The shallow Cohagen soil is on the higher parts of the landscape, and the Vebar soil is on the mid and lower parts. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Cohagen soil has a surface layer of brown, calcareous loamy very fine sand about 3 inches thick. The underlying material to a depth of about 16 inches is pale brown, calcareous, very friable loamy very fine sand. Pale brown and pale yellow, calcareous, soft sandstone is at a depth of 16 inches. In places, the surface layer is loam and the soil contains more clay and less sand than is typical for Cohagen soils.

Typically, the Vebar soil has a surface layer of dark brown fine sandy loam about 4 inches thick. The subsoil is about 24 inches of very friable and friable fine sandy loam. It is brown in the upper part and light yellowish brown in the lower part. Light gray, calcareous, soft sandstone is at a depth of about 28 inches.

Included with these soils in mapping are small areas of Lantry soils and Rock outcrop. These included areas make up about 10 percent of the unit. The moderately deep Lantry soils are below the Cohagen soil in some areas. They are calcareous at or near the surface and contain less sand than the Vebar soil. The Rock outcrop consists of ledges of hard sandstone directly below ridgetops or on the shoulders of entrenched drainageways.

The Cohagen soil is low in fertility and in content of organic matter. The Vebar soil is medium in fertility and moderately low in content of organic matter. Available water capacity is very low in the Cohagen soil and low in the Vebar soil. The root zone in both soils is limited by the underlying sandstone. Permeability is moderately rapid above the sandstone. Runoff is medium to rapid.

All areas remain in native grass and are used for range. These soils have fair to good potential for range and rangeland wildlife habitat and poor potential for crops, tame pasture and hayland, windbreaks and environmental plantings, and most recreation and engineering uses.

These soils are best suited to range. The natural plant cover is a mixture of tall, mid, and short grasses. Management that maintains an adequate plant cover and ground mulch helps to control soil blowing and erosion and improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Under such conditions, the risk of sand blowouts generally increases along livestock trails and around watering facilities. Proper grazing use and deferred grazing help maintain or improve the range condition.

These soils generally are not suited to crops, tame pasture and hayland, and windbreaks because they are moderately steep and steep and are highly susceptible to soil blowing and erosion. Disturbed areas of the less steep Vebar soil can be seeded to tame pasture plants, but range seeding generally is the preferred method of reestablishing a grass cover. Environmental plantings can be established in the areas of Vebar soil on the lower part of the landscape.

The mid and lower parts of the landscape where the soils are less steep are the best sites for buildings. Revegetating disturbed areas as soon as possible reduces the risks of soil blowing and erosion. The lower parts of the landscape where the soils are deeper and less steep are the best sites for waste disposal systems.

Local roads and streets should be constructed in the less steep areas and graded to shed water. Roadside erosion-control measures help to control soil blowing and erosion in borrow areas. Capability unit VIIe-4; Cohagen soil in Shallow range site, Vebar soil in Sandy range site.

DaB—Daglum-Felor loams, 2 to 6 percent slopes. This map unit consists of deep, well drained and moderately well drained, gently sloping soils in upland valleys. Typically, it is on slight rises and in swales. Slopes are mostly 2 to 6 percent but are less than 2 percent in some included areas in narrow swales. Individual areas are irregular in shape and range from 15 to about 150 acres in size. They are about 60 percent Daglum soil and 40 percent Felor soil. The Daglum soil is in swales and on the foot slopes of the rises. The Felor soil generally is on the rises. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Daglum soil has a surface layer of grayish brown loam about 5 inches thick. The subsurface layer is gray silt loam about 2 inches thick. The subsoil is about 10 inches of grayish brown, very firm clay and silty clay. The underlying material to a depth of 60 inches is grayish brown, calcareous silty clay loam. It has spots of gypsum in the upper part. In places, the soil lacks a distinct gray subsurface layer and visible gypsum and other salts are at a greater depth than is typical for Daglum soils. In some areas the depth to siltstone or shale is slightly less than 40 inches.

Typically, the Felor soil has a surface layer of loam about 11 inches thick. It is grayish brown in the upper part and dark grayish brown in the lower part. The subsoil is about 28 inches thick. The upper part is brown, friable sandy clay loam, and the lower part is pale yellow and light brown, firm silty clay that is calcareous at a depth of 34 inches. The underlying material to a depth of 60 inches is white and light reddish brown, calcareous silty clay. In places the soil does not have the layers of firm silty clay within a depth of 40 inches. On the higher parts of the landscape, the depth to sandstone is less than 40 inches and in places the subsoil contains less sand than is typical for Felor soils.

The Daglum soil is low in fertility and moderate in content of organic matter. Available water capacity is moderate in this soil, and the claypan subsoil releases moisture slowly to plants and limits the growth of roots. The availability of plant nutrients is affected by the sodium content in the Daglum soil. The Felor soil is medium in fertility and moderate in content of organic matter. Available water capacity is moderate or high. Permeability is very slow in the Daglum soil. It is moderate in the upper part of the Felor soil and slow in the lower part. The shrink-swell potential is high in the Daglum soil and in the lower part of the Felor soil. Runoff is medium.

About half of the acreage is used for crops. The rest is in native grass and is used for range and hay. These soils have fair to good potential for range, tame pasture and hayland, and most recreation uses; fair potential for crops; and poor potential for windbreaks and environmental plantings and for most engineering uses. The potential for openland and rangeland wildlife habitat is poor on the Daglum soil and good on the Felor soil.

These soils are better suited to small grain, alfalfa, and tame grasses than to a row crop, such as corn, because the intake of water is slow in the Daglum soil. Controlling erosion and soil blowing, conserving moisture, and improving water intake in the Daglum soil are the main concerns if the soils are cropped. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help to control erosion and soil blowing and conserve moisture. Chiseling or subsoiling improves water intake in the Daglum soil. Returning crop residue to the soils helps maintain fertility and tilth.

Seeding these soils to suited tame pasture plants is an effective means of controlling erosion and soil blowing. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help to keep the pasture in good condition after it is established.

These soils are well suited to range. The natural plant cover is a mixture of mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

These soils are poorly suited to windbreaks and environmental plantings. Windbreaks can be planted if optimum height is not expected or required. The sodium content in the Daglum soil limits the choice of trees and shrubs, and the clayey subsoil and underlying material of both soils limit the growth of roots. A year of fallow prior to planting helps eliminate grasses and weeds and conserves moisture. Planting the trees and shrubs on the contour also conserves moisture.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling and by low strength, which limits the ability of the soils to support loads. Sewage lagoons can be constructed in the less sloping areas. Septic tank filter fields function poorly because these soils absorb liquid waste slowly, but this limitation can be partly overcome by enlarging the absorption area.

Local roads and streets should be graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening or replacing the base material helps to overcome this limitation. Daglum soil in capability unit IVs-3, Claypan range site; Felor soil in capability unit IIe-1, Silty range site.

Db—Dimmick and Heil soils. This map unit consists of deep, very poorly drained and poorly drained, level soils in closed depressions in the uplands. These soils generally are flooded by ponded water early in the growing season. Slopes generally are less than 1 percent. Individual areas are circular or irregularly shaped and range from 4 to about 25 acres in size. Some areas are dominantly the very poorly drained Dimmick soil, and some are dominantly the poorly drained Heil soil. In the rest of the areas, the proportion of each soil varies. The Dimmick soil generally is in the center of the depressions.

Typically, the Dimmick soil has a surface layer of gray, mottled silty clay about 6 inches thick. The subsurface layer is about 34 inches of dark gray and gray, firm clay. To a depth of 48 inches, the underlying material is light olive gray clay. Below this to a depth of 60 inches, it is gray and pale olive, calcareous clay.

Typically, the Heil soil has a surface layer of gray silty clay loam about 3 inches thick. The subsoil is about 39 inches thick. It is dark gray, very firm silty clay in the upper part and gray, calcareous silty clay in the lower part. To a depth of 48 inches, the underlying material is pale olive, calcareous silty clay. Below this to a depth of 60 inches, it is calcareous sandy loam.

Included with these soils in mapping are small areas of Belfield, Daglum, and Rhoades soils, which make up less than 10 percent of the unit. These included soils are on the edges of the depressions and are well drained or moderately well drained.

The Dimmick and Heil soils are high in content of organic matter, but they are in poor tilth and are difficult to work. The Dimmick soil is high in fertility, but the sodium content of the Heil soil adversely affects the availability of plant nutrients. Available water capacity is moderate or high in both soils, but the clayey subsoil releases moisture slowly to plants and limits the growth of roots, especially in the Heil soil. Permeability is very slow in both soils. Both shrink and swell markedly upon drying and wetting. Runoff is ponded, and both soils have a seasonal high water table early in the growing season.

About half of the areas are farmed. The other areas remain in native grass and are used for range and hay. These soils have fair potential for range and poor potential for crops, tame pasture and hayland, windbreaks and environmental plantings, recreation uses, and most engineering uses. If drainage is adequate or has been improved, the Dimmick soil has fair potential for crops and for tame pasture and hayland. The potential for openland and rangeland wildlife habitat is fair on the Dimmick soil and poor on the Heil soil.

These soils are best suited to range. The natural plant cover is mainly tall grasses and sedges on the Dimmick soil and western wheatgrass on the Heil soil. Because the soils are subject to alternate wet and dry periods, the plant cover is not so stable as that on most upland soils. Grazing when the soils are wet compacts the surface layer and adversely affects drainage. If the range is overgrazed, the more desirable grasses are replaced by sedges, weeds, and undesirable plants. Under these conditions, bare ground generally is evident. Proper grazing use, deferred grazing, and timely grazing help maintain or improve the range condition. These soils generally are favorable sites for excavated ponds.

These soils generally are not suited to crops, tame pasture and hayland, and windbreaks because of wetness, poor tilth, and very slow permeability. Crops commonly drown in years of normal or above normal precipitation. Areas where the Dimmick soil has been drained can be successfully farmed, but crops grow poorly on the Heil soil because of the sodium content and the droughtiness late in summer. Crop residue management, minimum tillage, timely tillage, and chiseling or subsoiling improve tilth and water intake in the areas where the Dimmick soil has been drained and farmed. Drained areas of the Dimmick soil can be used for tame pasture and environmental plantings, but the choice of grasses, trees, and shrubs is limited. The Heil soil is not suited to these uses.

These soils generally are not suited as sites for buildings and septic tank absorption fields because of flooding and the seasonal high water table. Sewage lagoons can be constructed on these soils if the embankments are above expected flood levels. Local roads should be constructed on the adjacent uplands. If roads are constructed across areas of these soils, they should be graded above expected flood levels and suitable base material should be hauled in from other areas. Dimmick soil in capability unit Vw-4, IIIw-2 if drained, and in Wetland range site; Heil soil in capability unit VIs-1, Closed Depression range site.

FaA—Farnuf loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on terraces and uplands. Individual areas are irregular in shape and range from 15 to about 100 acres in size. Slopes are plane to slightly convex.

Typically, the surface layer is brown loam about 8 inches thick (fig. 6). The subsoil is about 17 inches thick. It is brown, friable clay loam in the upper part and light brownish gray, calcareous loam in the lower part. To a depth of 35 inches, the underlying material is light yellowish brown, calcareous loam that has spots and streaks of lime. Below this to a depth of 60 inches, it is light brownish gray, calcareous loam. In places the upper part of the subsoil is loam and contains about the same amount of clay as the surface layer.

Included with this soil in mapping are small areas of Belfield, Manning, Stady, and Tally soils, which make up about 10 percent of the unit. Belfield soils are in low areas and along drainageways. They contain more clay and sodium in the subsoil than the Farnuf soil. Manning, Stady, and Tally soils are on very slight rises. Manning and Stady soils have sand and gravel within a depth of 40 inches. Tally soils contain more sand than the Farnuf soil.

This soil is medium in fertility and in content of organic matter. It can be easily tilled throughout a wide range in moisture content. Available water capacity is high, and permeability is moderate. The shrink-swell potential also is moderate. Runoff is slow.

Many areas are farmed. Some remain in native grass and are used for range and hay. This soil has good potential for crops, tame pasture and hayland, range, openland and rangeland wildlife habitat, windbreaks and environmental plantings, and recreation uses. It has fair potential for most engineering uses.

This soil is well suited to corn, small grain, alfalfa, and tame grasses. The periodic shortage of moisture common to the climate is the main concern if the soil is cropped. The hazard of soil blowing is slight to moderate. Stubble mulch, crop residue management, minimum tillage, and field windbreaks help conserve moisture and control soil blowing. Returning crop residue to the soil helps maintain fertility and tilth.

All climatically suited tame pasture plants grow well on this soil. Proper stocking rates, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help to maintain or improve the range condition.

This soil is well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. A year of fallow prior to planting helps eliminate grasses and weeds and conserves moisture.

If buildings are constructed on this soil, properly designing foundations and footings and diverting water away from the buildings help to prevent the structure damage caused by shrinking and swelling. Enlarging the absorption area helps to overcome the slow absorption of liquid waste in septic tank filter fields. Seepage in sewage lagoons can be prevented by sealing the sides and bottom of the lagoon.

Local roads and streets should be graded to shed water. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Keeping moisture away from the subgrade reduces the risk of road damage caused by frost action and by shrinking and swelling.

As a result of the high available water capacity, a moderate intake rate, and favorable slopes, this soil is well suited to irrigation. Capability unit IIc-2; Silty range site.

FaB—Farnuf loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on terraces and uplands. Individual areas are irregular in shape and range from 15 to about 60 acres in size. Slopes are plane to slightly convex.

Typically, the surface layer is brown loam about 8 inches thick. The subsoil is about 17 inches thick. It is brown, friable clay loam in the upper part and light brownish gray, calcareous loam in the lower part. To a depth of 35 inches, the underlying material is light yellowish brown, calcareous loam that has spots and streaks of lime. Below this to a depth of 60 inches, it is light brownish gray, calcareous loam. In places the upper part of the subsoil is loam and contains about the same amount of clay as the surface layer.

Included with this soil in mapping are small areas of Belfield and Tally soils, which make up less than 10 percent of the unit. Belfield soils are in swales and along drainageways. They contain more clay and sodium in the subsoil than the Farnuf soil. Tally soils are on some of the ridges. They contain more sand than the Farnuf soil.

This soil is medium in fertility and in content of organic matter. It can be easily tilled throughout a wide range in moisture content. Available water capacity is high, and permeability is moderate. The shrink-swell potential also is moderate. Runoff is medium.

Many areas are farmed. Some remain in native grass and are used for range and hay. This soil has good potential for crops, tame pasture and hayland, range, openland and rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses. It has fair potential for most engineering uses.

This soil is well suited to corn, small grain, alfalfa, and tame grasses. Controlling erosion and soil blowing is the main concern if the soil is cropped. Conserving moisture and maintaining fertility also are important. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and conserve moisture. Wind stripcropping and field windbreaks help control soil blowing. Returning crop residue to the soil helps maintain fertility and tilth.

Seeding this soil to tame pasture plants is an effective means of controlling erosion and soil blowing. All climatically suited tame pasture plants grow well. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help to keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

This soil is well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. A year of fallow prior to planting helps eliminate grasses and weeds. Planting the trees and shrubs on the contour helps conserve moisture.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Enlarging the absorption area helps to overcome the slow absorption of liquid waste in septic tank filter fields. Sewage lagoons can be constructed on the lower part of the landscape where slopes are less steep. Excessive seepage from sewage lagoons can be reduced by sealing the sides and bottom of the lagoon.

Local roads and streets should be graded to shed water. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Keeping moisture away from the subgrade reduces the risk of road damage caused by frost action and by shrinking and swelling. Capability unit IIe-1; Silty range site.

FbA—Farnuf-Daglum loams, 0 to 2 percent slopes. This map unit consists of deep, well drained and moderately well drained, nearly level soils on terraces and upland flats. Areas are irregularly shaped and range from 15 to about 50 acres in size. They are about 65 percent Farnuf soil and 25 percent Daglum soil. The well drained Farnuf soil is on very slight rises and generally has plane to slightly convex slopes. The moderately well drained Daglum soil is in swales and has slightly concave slopes. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Farnuf soil has a surface layer of brown loam about 8 inches thick. The subsoil is about 17 inches thick. It is brown, friable clay loam in the upper part and light brownish gray, calcareous loam in the lower part. To a depth of 35 inches, the underlying material is light yellowish brown, calcareous loam that has spots and streaks of lime. Below this to a depth of 60 inches, it is light brownish gray, calcareous loam. In places the upper part of the subsoil is loam and contains about the same amount of clay as the surface layer. In some of the low areas, the surface layer is more than 8 inches thick. On some of the very slight rises on uplands, the depth to bedrock is slightly less than 40 inches.

Typically, the Daglum soil has a surface layer of grayish brown loam about 5 inches thick. The subsurface layer is gray silt loam about 2 inches thick. The subsoil is about 10 inches of grayish brown, very firm clay and silty clay. The underlying material to a depth of 60 inches is grayish brown, calcareous silty clay loam. It has spots of gypsum in the upper part. In places, the soil lacks a distinct gray subsurface layer and visible gypsum and other salts are at a greater depth than is typical for Daglum soils. In some areas the depth to bedrock is slightly less than 40 inches.

Included with these soils in mapping are small areas of Grail, Rhoades, and Tally soils and Slickspots. These included areas make up about 10 percent of the unit. Grail soils are in some of the swales. They contain less sodium than the Daglum soil. Rhoades soils and Slickspots are intermingled with the Daglum soil. Rhoades soils are shallower over a claypan subsoil than the Daglum soil. Slickspots have visible salts at or near the surface. Tally soils are intermingled with the Farnuf soil. They contain more sand and less clay than that soil.

The Farnuf soil is medium in fertility and moderate in content of organic matter. It can be easily tilled throughout a wide range in moisture content. Available water capacity is high in the Farnuf soil and moderate in the Daglum soil. The Daglum soil is low in fertility and moderate in content of organic matter. Its claypan subsoil releases moisture slowly to plants and limits the growth of roots. The sodium content in the Daglum soil adversely affects the availability of plant nutrients. Permeability is moderate in the Farnuf soil and very slow in the Daglum soil. The shrink-swell potential is moderate in the Farnuf soil and high in the Daglum soil. Runoff is slow.

Most areas are farmed. Some remain in native grass and are used for range and hay. These soils have fair to good potential for crops, tame pasture and hayland, range, and recreation uses and fair to poor potential for most engineering uses. The potential for windbreaks and environmental plantings and for openland and rangeland wildlife habitat is good on the Farnuf soil and poor on the Daglum soil.

These soils are suited to corn, small grain, alfalfa, and tame grasses. Crop growth commonly is uneven, especially during dry years, because of the salts and sodium in the Daglum soil. Conserving moisture and improving water intake in the Daglum soil are the main management problems if the soils are cropped. Controlling soil blowing and maintaining fertility also are important. Stubble mulch, crop residue management, and minimum tillage help conserve moisture. Chiseling or subsoiling improves water intake in the Daglum soil. Wind stripcropping helps control soil blowing. Returning crop residue to the soils helps maintain fertility and tilth.

Seeding these soils to suited tame pasture plants is an effective means of controlling soil blowing. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help to keep the pasture in good condition after it is established.

These soils are well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

The Farnuf soil is a better site for windbreaks and environmental plantings, but suited trees and shrubs can be planted on the Daglum soil unless optimum height is expected or required. A year of fallow prior to planting helps eliminate grasses and weeds and conserves moisture.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Enlarging the absorption area helps to overcome the slow absorption of liquid waste in septic tank filter fields. If possible, septic tank filter fields should be constructed on the Farnuf soil and sewage lagoons on the Daglum soil.

Local roads and streets should be graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Keeping moisture away from the subgrade helps to prevent the road damage caused by frost action and by shrinking and swelling. Farnuf soil in capability unit IIc-2, Silty range site; Daglum soil in capability unit IVs-2, Claypan range site.

FcB—Felor-Yegen loams, 2 to 6 percent slopes. This map unit consists of deep, well drained, gently sloping soils on uplands. Slopes are mostly 2 to 6 percent but in some small included areas are less than 2 percent or as much as 9 percent. Areas are irregularly shaped and range from 15 to about 100 acres in size. They are about 60 percent Felor soil and 30 percent Yegen soil. The Felor soil is on the mid and lower parts of the landscape. The Yegen soil is on the tops and upper sides of ridges and knolls on the higher parts of the landscape. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Felor soil has a surface layer of loam about 11 inches thick. The surface layer is grayish brown in the upper part and dark grayish brown in the lower part. The subsoil is about 28 inches thick. The upper part is brown, friable sandy clay loam, and the lower part is pale yellow and light brown, firm silty clay that is calcareous at a depth of about 34 inches. The underlying material to a depth of 60 inches is white and light reddish brown, calcareous silty clay.

Typically, the Yegen soil has a surface layer of dark grayish brown loam about 5 inches thick. The subsoil is about 26 inches of friable sandy clay loam. It is brown in the upper part, pale brown in the next part, and pale yellow and calcareous in the lower part. The underlying material to a depth of 51 inches is pale yellow, calcareous sandy clay loam. Pale yellow, soft sandstone is at a depth of 51 inches. In places, the subsoil is clay loam and the depth to sandstone is less than 40 inches.

Included with these soils in mapping are small areas of Belfield and Daglum soils, which make up less than 10 percent of the unit. These included soils are on foot slopes and in swales. They have a claypan subsoil and contain more sodium than Felor and Yegen soils.

The Felor and Yegen soils are medium in fertility and moderate or moderately low in content of organic matter. They can be easily tilled throughout a wide range of moisture content. Available water capacity is moderate or high. Permeability is moderate in the upper part of both soils and is slow in the lower part of the Felor soil and moderate or moderately rapid in the lower part of the Yegen soil. The shrink-swell potential is moderate in the upper part of both soils and high in the lower part of the Felor soil. Runoff is medium.

Over half of the acreage is farmed. The rest remains in native grass and is used for range and hay. These soils have good potential for crops, tame pasture and hayland, range, openland and rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses. They have poor to fair potential for most engineering uses.

These soils are suited to corn, small grain, alfalfa, and tame grasses. Controlling erosion and soil blowing and conserving moisture are the main management problems if the soils are cropped. Maintaining fertility and tilth also is important. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and conserve moisture. Wind stripcropping and field windbreaks help control soil blowing. Returning crop residue to the soils helps maintain fertility and tilth.

Seeding these soils to suited tame pasture plants is an effective means of controlling erosion and soil blowing. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

These soils are suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

These soils are well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. A year of fallow prior to planting helps eliminate grasses and weeds. Planting the trees and shrubs on the contour conserves moisture.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Enlarging the absorption area helps to overcome the slow absorption of liquid waste in septic tank filter fields. The areas of Felor soil on the lower part of the landscape where slopes are more gentle are the best sites for sewage lagoons.

Local roads and streets should be graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Keeping moisture away from the subgrade helps to prevent the road damage caused by frost action and by shrinking and swelling. Capability unit IIe-1; Silty range site.

FcC—Felor-Yegen loams, 6 to 9 percent slopes. This map unit consists of deep, well drained, moderately sloping soils on uplands. Slopes are dominantly 6 to 9 percent but in some small included areas are as much as 15 percent. Individual areas are irregular in shape and range from 15 to about 150 acres in size. They are about 55 percent Felor soil and 35 percent Yegen soil. The Felor soil is on the mid and lower parts of the landscape. The Yegen soil is on the tops and upper sides of ridges and knolls. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Felor soil has a surface layer of loam about 11 inches thick. The surface layer is grayish brown in the upper part and dark grayish brown in the lower part. The subsoil is about 28 inches thick. The upper part is brown, friable sandy clay loam, and the lower part is pale yellow and light brown, firm silty clay that is calcareous at a depth of about 34 inches. The underlying material to a depth of 60 inches is white and light reddish brown, calcareous silty clay.

Typically, the Yegen soil has a surface layer of dark grayish brown loam about 5 inches thick. The subsoil is about 26 inches of friable sandy clay loam. It is brown in the upper part, pale brown in the next part, and pale yellow and calcareous in the lower part. The underlying material to a depth of 51 inches is pale yellow, calcareous sandy clay loam. Pale yellow, soft sandstone is at a depth of 51 inches. In places the depth to sandstone is slightly less than 40 inches.

Included with these soils in mapping are small areas of Daglum soils, which make up less than 10 percent of the unit. These included soils are on foot slopes and along drainageways. They have a claypan subsoil and contain more sodium than Felor and Yegen soils.

The Felor and Yegen soils are medium in fertility and moderate or moderately low in content of organic matter. They can be easily tilled throughout a wide range in moisture content. Available water capacity is moderate or high. Permeability is moderate in the upper part of both soils and is slow in the lower part of the Felor soil and moderate or moderately rapid in the lower part of the Yegen soil. The shrink-swell potential is moderate in the upper part of both soils and high in the lower part of the Felor soil. Runoff is medium.

Less than half of the acreage is farmed. Many areas remain in native grass and are used for range. These soils have good potential for range, rangeland wildlife habitat, and most recreation uses; fair potential for crops, tame pasture and hayland, openland wildlife habitat, and windbreaks and environmental plantings; and poor to fair potential for most engineering uses.

These soils are better suited to small grain, alfalfa, and tame grasses than to a row crop, such as corn. The hazard of erosion is severe, and the hazard of soil blowing is moderate. Controlling erosion and soil blowing and conserving moisture are the main concerns if the soils are cropped. Maintaining fertility and tilth also is important. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and conserve moisture. Wind stripcropping and field windbreaks help control soil blowing. Returning crop residue to the soils helps maintain fertility and tilth.

Seeding these soils to suited tame pasture plants is an effective means of controlling erosion and soil blowing. All climatically suited tame pasture plants grow well, but bunch-grass species should not be planted alone because of the erosion hazard. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

These soils are well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

These soils are suited to windbreaks and environmental plantings. Planting suited trees and shrubs on the contour helps to conserve moisture and reduce the risk of erosion. A year of fallow prior to planting helps eliminate grasses and weeds.

If buildings are constructed on these soils, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling. Enlarging the absorption area helps to overcome the slow absorption of liquid waste in septic tank filter fields. Sewage lagoons can be constructed in the areas of Felor soil on the lower part of the landscape where slopes are less steep.

Local roads and streets should be graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Keeping moisture away from the subgrade helps to prevent the road damage caused by frost action and by shrinking and swelling. In borrow and cut areas, roadside erosion-control measures generally are needed to control erosion and soil blowing. Capability unit IIIe-1; Silty range site.

Fd—Fluvaquents, saline. This map unit consists of deep, poorly drained, nearly level, saline soils on bottom land and along upland drainageways. These soils are subject to flooding. Slopes generally are plane to concave. Individual areas generally are long and narrow and range from 4 to about 50 acres in size.

Typically, the surface layer is loam or light clay loam, but it ranges from sandy loam to clay. Accumulations of salts generally are concentrated in the surface layer and form a thin gray crust on the surface upon drying. The underlying material is dominantly loam, but it commonly is stratified by finer and coarser textured material ranging from clay to sand or sand and gravel.

Included with these soils in mapping are small areas of Rhoades and Trembles soils and Slickspots. These included soils make up as much as 25 percent of some areas. The moderately well drained Rhoades soil is slightly higher on the landscape than the Fluvaquents. It has a claypan subsoil. Slickspots are intermingled with the Fluvaquents and with the Rhoades soil. They generally support little or no vegetation. The well drained Trembles soils are slightly higher on the landscape than the Fluvaquents. They contain less salts.

Fluvaquents are low in fertility and in content of organic matter. The availability of plant nutrients is adversely affected by the salt content. Permeability ranges from slow to moderately rapid. Runoff is slow, and the water table is at or near the surface during much of the growing season.

All areas remain in native vegetation and are used for range. These soils have fair potential for range and rangeland wildlife habitat and poor potential for crops, tame pasture and hayland, windbreaks and environmental plantings, and recreation and engineering uses.

These soils are best suited to range. The natural plant cover is a mixture of tall, mid, and short grasses that are salt tolerant. The main concern of management is maintaining the more desirable grasses that provide forage for livestock. Overgrazing the range generally results in a plant cover dominated by inland saltgrass and other undesirable plants. Under these conditions, a considerable amount of bare ground commonly is evident. Proper grazing use, deferred grazing, and timely grazing help maintain or improve the range condition. In a normal year these soils can produce 3,000 pounds of air-dry forage per acre if the range is in excellent condition.

These soils generally are not suited to crops, tame pasture and hayland, and windbreaks because of wetness and salinity. Some sites that are in poor range condition, however, can be seeded to tall wheatgrass and western wheatgrass. Environmental plantings are limited to those trees or shrubs that can tolerate salts and poor drainage.

These soils generally are not suited as sites for buildings and waste disposal facilities because they are wet. Alternative sites for local roads and streets should be selected. The roads that are constructed on these soils should be graded above expected flood levels. Also, suitable base material should be hauled in to improve the ability of the soils to support vehicular traffic. Capability unit VIIs-5; Saline Lowland range site.

Ga—Grail silt loam. This deep, moderately well drained, nearly level soil is in swales on uplands. In most areas it is subject to brief flooding by runoff from adjacent soils. Individual areas typically are long and irregularly shaped and range from 10 to 30 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 33 inches of firm silty clay loam and silty clay. It is grayish brown in the upper part and light brownish gray in the lower part. The lower part is calcareous. The underlying material to a depth of 60 inches is light brownish gray, calcareous silty clay loam. On the edges of some areas, the subsoil is lighter colored and the depth to lime is less than is typical for Grail soils.

Included with this soil in mapping are small areas of Morton and Regent soils, which make up less than 10 percent of the unit. These well drained soils are on the edges of the unit. They are less than 40 inches deep over bedrock. Also, the Morton soil has a less clayey subsoil than the Grail soil.

This Grail soil is high in fertility and in content of organic matter. It can be easily tilled but tends to crust after hard rains. Available water capacity is high, and permeability is moderately slow. The shrink-swell potential is high. Runoff is slow, and the water table is at a depth of 3 to 6 feet early in the growing season.

Most areas are farmed. This soil has good potential for crops, tame pasture and hayland, range, openland wildlife habitat, and windbreaks and environmental plantings and poor potential for most recreation and engineering uses.

This soil is well suited to corn, small grain, alfalfa, and tame grasses. During some years temporary wetness delays planting in the spring. The main concern in managing this soil for crops, however, is the periodic shortage of moisture late in the growing season. Stubble mulch, crop residue management, and minimum tillage help conserve moisture and maintain fertility and tilth.

This soil is well suited to tame pasture and hayland. All climatically suited pasture plants grow well. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly tall and mid grasses. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

Suited trees and shrubs used as windbreaks and environmental plantings grow well on this soil. A year of fallow prior to planting helps eliminate grasses and weeds and conserves moisture.

This soil is not suited as a site for buildings unless it is protected against flooding. Properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Generally, the soil is not suited as a septic tank absorption field because of the flooding, the seasonal water table, and the slow absorption of liquid waste. Sewage lagoons can be constructed on this soil if the embankments are above flood levels.

Local roads and streets should be graded above expected flood levels. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Capability unit IIc-3; Overflow range site.

LaA—Lawther silty clay, 0 to 2 percent slopes. This deep, well drained, nearly level soil is in swales and on flats on uplands. Individual areas are irregular in shape and range from 20 to about 150 acres in size. Slopes are plane to slightly concave.

Typically, the surface layer is about 8 inches thick. The upper part is gray silty clay, and the lower part is dark gray clay. The subsoil is about 31 inches of gray, very firm clay. The underlying material to a depth of 60 inches is light gray clay. The soil is calcareous throughout. In places, the surface layer is silty clay loam and the content of clay increases distinctly in the subsoil.

Included with this soil in mapping are small areas of Daglum, Felor, Morton, Rhoades, and Yegen soils and Slickspots. These included areas make up about 10 percent of the unit. Daglum and Rhoades soils are along drainageways and in slightly depressed areas. They contain more sodium than the Lawther soil. Farnuf, Morton, and Yegen soils are on very slight rises. They contain less clay than the Lawther soil. Slickspots are intermingled with the Daglum or Rhoades soils. They have visible salts at or near the surface.

This Lawther soil is medium in fertility and moderate in content of organic matter. It is difficult to work, tends to crust after hard rains, and cracks when dry. Available water capacity is moderate or high. Permeability is slow, and the clayey subsoil releases moisture slowly to plants. The soil shrinks and swells markedly upon drying and wetting. Runoff is slow.

Most areas are farmed. This soil has good potential for crops, tame pasture and hayland, range, and rangeland wildlife habitat; fair potential for openland wildlife habitat and windbreaks and environmental plantings; fair to poor potential for recreation uses; and poor potential for most engineering uses.

This soil is suited to corn, small grain, alfalfa, and tame grasses. Improving water intake, maintaining tilth, and conserving moisture are the main concerns if this soil is cropped. Soil blowing also is a hazard if tilth deteriorates as a result of excessive tillage. Stubble mulch, crop residue management, and chiseling or subsoiling improve water intake and conserve moisture. Wind stripcropping helps control soil blowing. The return of crop residue to the soil, minimum tillage, and timely tillage help maintain tilth and fertility.

Seeding cultivated areas to tame pasture plants is an effective means of controlling soil blowing and improving soil structure. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition. Restricting grazing when the soil is wet helps prevent the damage to range plants and soil structure that can occur if the site is trampled by livestock.

This soil is moderately well suited to windbreaks and environmental plantings. Growth is less than optimum, however, because of the clayey subsoil. A year of fallow prior to planting helps eliminate grasses and weeds and conserves moisture.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Sewage lagoons function well on this soil, but the slow absorption of liquid waste is a limitation in septic tank filter fields. This limitation can be partly overcome by enlarging the absorption area.

Local roads and streets should be graded to shed water. Low strength limits the ability of this soil to support vehicular traffic, but strengthening or replacing the base material helps to overcome this limitation. Capability unit IIIs-3; Clayey range site.

LaB—Lawther silty clay, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands. Areas are irregularly shaped and range from 15 to about 200 acres in size. Slopes generally are long and smooth and are convex.

Typically, the surface layer is about 8 inches thick. The upper part is gray silty clay, and the lower part is dark gray clay. The subsoil is about 31 inches of gray, very firm clay. The underlying material to a depth of 60 inches is light gray clay. The soil is calcareous throughout. In places, the surface layer is silty clay loam and the content of clay increases distinctly in the subsoil. In some areas the depth to bedrock is slightly less than 40 inches.

Included with this soil in mapping are small areas of Daglum, Felor, Morton, Rhoades, and Yegen soils and Slickspots. These included areas make up about 10 percent of the unit. Daglum and Rhoades soils are on foot slopes and in swales. They contain more sodium than the Lawther soil. Felor, Morton, and Yegen soils generally are on the higher parts of the landscape. Felor soils contain less clay in the upper part than the Lawther soil, and Morton and Yegen soils contain less clay throughout. Slickspots are intermingled with areas of Daglum and Rhoades soils. They have visible salts at or near the surface.

This Lawther soil is medium in fertility and moderate in content of organic matter. It is difficult to work, tends to crust over after hard rains, and cracks when dry. Available water capacity is moderate or high. Permeability is slow, and the clayey subsoil releases moisture slowly to plants. The soil shrinks and swells markedly upon drying and wetting. Runoff is medium.

Most areas are farmed. This soil has good potential for crops, tame pasture and hayland, range, and rangeland wildlife habitat; fair potential for openland wildlife habitat and windbreaks and environmental plantings; fair to poor potential for recreation uses; and poor potential for most engineering uses.

This soil is suited to corn, small grain, alfalfa, and tame grasses. Controlling erosion and soil blowing, improving water intake, maintaining tilth, and conserving moisture are the major concerns if the soil is cropped. Stubble mulch, crop residue management, contour farming, terraces, and grassed waterways help control erosion and conserve moisture. Wind stripcropping helps control soil blowing. Chiseling or subsoiling improves water intake. The return of crop residue to the soil, minimum tillage, and timely tillage help maintain tilth and fertility.

Seeding cultivated areas to tame pasture plants is an effective means of controlling erosion and soil blowing. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition. Restricting grazing when the soil is wet helps prevent the damage to range plants and soil structure that can occur if the site is trampled by livestock.

This soil is only moderately well suited to windbreaks and environmental plantings. Growth is less than optimum because of the clayey subsoil. A year of fallow prior to planting helps eliminate grasses and weeds and conserves moisture. Planting the trees and shrubs on the contour also conserves moisture.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings helps to prevent the structure damage caused by shrinking and swelling. Sewage lagoons can be constructed on the lower part of the landscape where slopes are more gentle. Enlarging the absorption area helps to overcome the slow absorption of liquid waste in septic tank filter fields.

Local roads and streets should be graded to shed water. Low strength limits the ability of this soil to support vehicular traffic, but strengthening or replacing the base material helps to overcome this limitation. Capability unit IIIe-4; Clayey range site.

LaC—Lawther silty clay, 6 to 9 percent slopes. This deep, well drained, moderately sloping soil is on uplands. Individual areas are long and irregularly shaped and range from 15 to about 200 acres in size. Slopes generally are long and smooth and are convex.

Typically, the surface layer is about 8 inches thick. The upper part is gray silty clay, and the lower part is dark gray clay. The subsoil is about 31 inches of gray, very firm clay. The underlying material to a depth of 60 inches is light gray clay. The soil is calcareous throughout. In places, the surface layer is silty clay loam and the content of clay increases distinctly in the subsoil. In some areas the depth to bedrock is slightly less than 40 inches.

Included with this soil in mapping are small areas of Daglum, Morton, Rhoades, and Wayden soils, which make up about 15 percent of the unit. Daglum and Rhoades soils are on foot slopes and in sags. They contain more sodium than the Lawther soil. Morton soils generally are on the higher parts of the landscape. They are less clayey than the Lawther soil. Wayden soils are on the tops and upper sides of some of the ridges. They are less than 20 inches deep over bedrock.

This Lawther soil is medium in fertility and moderate in content of organic matter. It is difficult to work, tends to crust over after hard rains, and cracks when dry. Available water capacity is moderate or high. Permeability is slow, and the clayey subsoil releases moisture slowly to plants. The soil shrinks and swells markedly upon drying and wetting. Runoff is medium.

About half the acreage is farmed. This soil has good potential for range and rangeland wildlife habitat; fair potential for crops, tame pasture and hayland, openland wildlife habitat, and windbreaks and environmental plantings; fair to poor potential for recreation uses; and poor potential for most engineering uses.

This soil is better suited to small grain, alfalfa, and tame grasses than to a row crop, such as corn, because the hazard of erosion is severe. Controlling erosion and soil blowing, improving water intake, maintaining tilth, and conserving moisture are the major concerns if the soil is cropped. Stubble mulch, crop residue management, close-sown crops, contour farming, terraces, and grassed waterways help to control erosion and conserve moisture. Wind stripcropping helps control soil blowing. Chiseling or subsoiling improves water intake. The return of crop residue to the soil, minimum tillage, and timely tillage help maintain tilth and fertility.

Seeding cultivated areas to tame pasture plants is an effective means of controlling erosion and soil blowing. All climatically suited tame pasture plants grow well, but bunch-grass species should not be planted alone because of the severe erosion hazard. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

This soil is only moderately well suited to windbreaks and environmental plantings. Growth is less than optimum because of the clayey subsoil. A year of fallow prior to planting helps eliminate grasses and weeds and conserves moisture. Planting the trees and shrubs on the contour also conserves moisture and reduces the risk of erosion.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Sewage lagoons can be constructed on the lower part of the landscape where slopes are less steep and the site is more easily leveled. The slow absorption of liquid waste is a severe limitation in septic tank absorption fields, but this limitation generally can be overcome by enlarging the absorption area.

Local roads and streets should be graded to shed water. Low strength limits the ability of this soil to support vehicular traffic, but strengthening or replacing the base material helps to overcome this limitation. Roadside erosion-control measures are needed in borrow and cut areas. Capability unit IVe-4; Clayey range site.

LbB—Lefor fine sandy loam, 2 to 6 percent slopes. This moderately deep, well drained, gently sloping soil is on uplands. Individual areas are irregular in shape and range from 20 to about 300 acres in size. Slopes are smooth and convex and commonly are broken by narrow swales.

Typically, the surface layer is dark brown fine sandy loam about 7 inches thick. The subsoil is about 22 inches of friable sandy clay loam. It is yellowish brown in the upper part and light olive brown in the lower part. The underlying material to a depth of 37 inches is light brownish gray, calcareous fine sandy loam. Light yellowish brown, calcareous soft sandstone is at a depth of 37 inches. It crushes easily to sandy loam. On the higher part of the landscape, the subsoil contains less clay than is typical for Lefor soils. In places, the surface layer is loam and the subsoil is clay loam. In some places on the lower part of the landscape, the depth to sandstone is more than 40 inches.

Included with this soil in mapping are small areas of Arnegard, Belfield, Regent, and Watrous soils, which make up about 10 percent of the unit. Arnegard and Belfield soils are in swales. The moderately well drained Arnegard soils have a thicker surface layer than the Lefor soil, and Belfield soils have a silty clay subsoil and contain more sodium than the Lefor soil. Regent soils are intermingled with the Lefor soil. They contain more clay. Watrous soils generally are on the higher part of the landscape. They are underlain by hard sandstone within a depth of 24 inches.

This Lefor soil is medium in fertility and moderately low in content of organic matter. It can be easily tilled throughout a wide range in moisture content. Available water capacity and permeability are moderate. The shrink-swell potential is moderate in the subsoil. Runoff is medium.

Most areas are farmed. This soil has good potential for range, rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses and fair potential for crops, tame pasture and hayland, openland wildlife habitat, and most engineering uses.

This soil is suited to corn, small grain, alfalfa, and tame grasses. Spring-sown small grain is better suited than winter wheat because the hazard of soil blowing is severe. Controlling soil blowing and erosion and conserving moisture are the main concerns if the soil is cropped. Maintaining fertility and tilth also are important. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control soil blowing and erosion and conserve moisture. Wind stripcropping and field windbreaks help control soil blowing. Returning crop residue to the soil helps maintain fertility and tilth.

Seeding cultivated areas to tame pasture plants is an effective means of controlling soil blowing and erosion. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is a mixture of tall, mid, and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

This soil is well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Keeping a cover of crop residue on the surface helps control soil blowing during site preparation. Planting the trees and shrubs on the contour helps conserve moisture.

The moderate depth to sandstone generally is not a serious limitation for building site development because the sandstone is soft and rippable. Foundations and footings should be designed to overcome the moderate shrink-swell potential. Septic tank absorption fields can be constructed on the lower part of the landscape where the soil is deeper. Sewage lagoons also can be constructed on the lower part of the landscape. Sealing the sides and bottom of the lagoon helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Capability unit IIIe-8; Sandy range site.

MaB—Manning fine sandy loam, 0 to 6 percent slopes. This somewhat excessively drained, nearly level to gently sloping soil is on terraces. It is moderately deep over sand and gravel. Individual areas are long or irregularly shaped and range from 15 to about 50 acres in size. Slopes are dominantly 2 to 6 percent but are less than 2 percent in some areas.

Typically, the surface layer is grayish brown fine sandy loam about 4 inches thick. The subsoil is about 16 inches thick. It is brown, very friable fine sandy loam in the upper part and light olive brown sandy loam in the lower part. To a depth of 26 inches, the underlying material is light brownish gray, calcareous sandy loam. Below this to a depth of 60 inches, it is light brownish gray, calcareous sand and gravel. In places the depth to sand and gravel is slightly more than 40 inches.

Included with this soil in mapping are small areas of Reeder and Wabek soils, which make up less than 10 percent of the unit. These included soils generally are on the higher parts of the landscape. Reeder soils contain more clay than the Manning soil and are underlain by sandstone within a depth of 40 inches. Wabek soils have sand and gravel within a depth of 14 inches.

This Manning soil is medium in fertility and moderately low in content of organic matter. It can be easily tilled throughout a wide range in moisture content. Available water capacity is low or moderate. Permeability is moderately rapid in the upper part and rapid in the underlying material. The shrink-swell potential is low. Runoff is slow.

Most areas remain in native grass and are used for range. A few areas are farmed. This soil has good potential for range, rangeland wildlife habitat, and most recreation and engineering uses. It has fair potential for crops, tame pasture and hayland, and openland wildlife habitat and poor potential for windbreaks and environmental plantings.

This soil is well suited to range. The natural plant cover is a mixture of tall, mid, and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

This soil is better suited to small grain and tame grasses than to corn and alfalfa because it is droughty. Spring-sown small grain is better suited than winter wheat because the hazard of soil blowing is severe. Controlling soil blowing and erosion and conserving moisture are the main concerns if the soil is cropped. Stubble mulch, crop residue management, minimum tillage, close-sown crops, and wind stripcropping help control soil blowing and erosion and conserve moisture. Returning crop residue to the soil helps maintain fertility and tilth.

Seeding cultivated areas to tame pasture plants is an effective means of controlling soil blowing and erosion. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is poorly suited to windbreaks because it is droughty. It can be used for windbreaks unless optimum survival, growth, and vigor are required or expected. Keeping a cover of crop residue on the surface helps control soil blowing during site preparation. Providing additional water increases the chance for survival of the trees and shrubs used as windbreaks and environmental plantings.

This soil has only slight limitations as a site for buildings, septic tank absorption fields, and local roads and streets. Other soils are better sites for sewage lagoons because excessive seepage is a problem on this soil. The effluent from all waste disposal systems can pollute shallow ground water.

This soil has fair potential for irrigation, but the low available water capacity and rapid permeability of the underlying sand and gravel should be considered in designing the irrigation system. Unless the amount of fine material is a problem, this soil is a potential source of sand and gravel for use in construction. Capability unit IIIe-10; Sandy range site.

MbB—Marmarth loam, 2 to 6 percent slopes. This moderately deep, well drained, gently sloping soil is on uplands. Individual areas are irregular in shape and range from 20 to about 200 acres in size. Slopes are smooth and slightly convex.

Typically, the surface layer is dark grayish brown loam about 7 inches thick. The subsoil is about 8 inches of grayish brown, friable heavy loam. The underlying material to a depth of 25 inches is light gray, calcareous loam. Light gray and yellow, calcareous, soft sandstone is at a depth of 25 inches. In places the subsoil contains more clay than is typical for Marmarth soils. On the higher parts of the landscape, the loam subsoil contains about the same amount of clay as the surface layer. In some places on the lower parts of the landscape, the depth to sandstone is more than 40 inches.

Included with this soil in mapping are small areas of Blackhall, Cabbart, Loburn, and Twilight soils, which make up about 15 percent of the unit. Blackhall and Cabbart soils are on some of the ridges. They are shallow to sandstone. Loburn soils are on foot slopes and in swales. They have a claypan subsoil and contain more sodium than the Marmarth soil. Twilight soils are on the higher parts of the landscape. They contain more sand than the Marmarth soil.

This Marmarth soil is medium in fertility and moderate in content of organic matter and can be easily tilled throughout a wide range in moisture content. It is somewhat droughty, and available water capacity is low. Permeability is moderate. The shrink-swell potential also is moderate. Runoff is medium.

Many areas are farmed. Some remain in native grass and are used for range and hay. This soil has good potential for tame pasture and hayland, range, rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses; fair potential for crops and openland wildlife habitat; and fair to poor potential for most engineering uses.

This soil is better suited to small grain, alfalfa, and tame grasses than to a row crop, such as corn. Controlling erosion and soil blowing, conserving moisture, and maintaining fertility and tilth are the main concerns if the soil is cropped. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and conserve moisture. Wind stripcropping and field windbreaks help control soil blowing. Returning crop residue to the soil helps maintain fertility and tilth.

Seeding cultivated areas to tame pasture plants is an effective means of controlling erosion and soil blowing. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less desirable short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

Suited trees and shrubs used as windbreaks and environmental plantings grow well on this soil. A year of fallow prior to planting a windbreak helps eliminate grasses and weeds and conserves moisture. Planting the trees on the contour also conserves moisture and helps to control erosion.

If buildings are constructed on this soil, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling. The lower parts of the landscape where the soil is deepest are the best sites for septic tank absorption fields. The slow absorption of liquid waste in septic tank absorption fields can be overcome by enlarging the absorption area. Sewage lagoons can be constructed on the lower part of the landscape where the limited depth to bedrock is less of a problem and the slopes are more gentle. Sealing the sides and bottom of the lagoon helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Keeping moisture away from the subgrade helps to prevent the road damage caused by frost action and by shrinking and swelling. Capability unit IIIe-1; Silty range site.

McA—Morton loam, 0 to 2 percent slopes. This moderately deep, well drained, nearly level soil is on uplands. Individual areas are irregular in shape and range from 20 to about 100 acres in size. Slopes are mostly plane to slightly convex.

Typically, the surface layer is brown loam about 7 inches thick. The subsoil is about 11 inches of friable silty clay loam. It is brown in the upper part and pale brown in the lower part. The lower part is calcareous (fig. 7). The underlying material to a depth of 32 inches is calcareous silty clay loam. It is light gray in the upper part and pale olive in the lower part. Pale olive, calcareous, soft siltstone is at a depth of 32 inches. In places the subsoil is loam and contains about the same amount of clay as the surface layer.

Included with this soil in mapping are small areas of Arnegard, Belfield, Rhoades, and Vebar soils, which make up less than 15 percent of the unit. Arnegard, Belfield, and Rhoades soils are in swales and along drainageways. The moderately well drained Arnegard soil has a thicker surface layer than the Morton soil. Belfield and Rhoades soils have a claypan subsoil and contain more sodium than the Morton soil. Vebar soils are on slight rises. They contain more sand than the Morton soil.

This Morton soil is medium in fertility and moderate in content of organic matter. It can be easily tilled, but the surface tends to crust after hard rains. The growth of roots is limited by the moderate depth to bedrock. Available water capacity and permeability are moderate. The shrink-swell potential also is moderate. Runoff is slow.

Most areas are cropped. Some remain in native grass and are used for range and hay. This soil has good potential for crops, tame pasture and hayland, range, openland and rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses. It has fair to poor potential for most engineering uses.

This soil is suited to corn, small grain, alfalfa, and tame grasses. The periodic shortage of moisture common to the climate is the main concern if the soil is cropped. Stubble mulch, crop residue management, and minimum tillage help conserve moisture and maintain fertility and tilth. Wind stripcropping and field windbreaks help control the slight hazard of soil blowing.

All climatically suited tame pasture plants grow well if this soil is seeded to tame pasture or hay. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help to maintain or improve the range condition.

Suited trees and shrubs used as windbreaks and environmental plantings grow well on this soil. A year of fallow prior to planting a windbreak helps eliminate grasses and weeds and conserves the moisture needed for survival.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. The underlying bedrock is rippable and generally is not a serious problem when excavations are made for basements. Enlarging the absorption area helps to overcome the slow absorption of liquid waste and the moderate depth to bedrock in septic tank filter fields. Sewage lagoons can be constructed on this soil if cuts in the lagoon area are held to a minimum. Sealing the sides and bottom of the lagoon helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Capability unit IIc-2; Silty range site.

McB—Morton loam, 2 to 6 percent slopes. This moderately deep, well drained, gently sloping soil is on uplands. Individual areas are irregular in shape and range from 20 to about 200 acres in size. Slopes are smooth and slightly convex.

Typically, the surface layer is brown loam about 7 inches thick. The subsoil is about 11 inches of friable silty clay loam. It is brown in the upper part and pale brown in the lower part. The lower part is calcareous. The underlying material to a depth of 32 inches is calcareous silty clay loam. It is light gray in the upper part and pale olive in the lower part. Pale olive, calcareous, soft siltstone is at a depth of 32 inches. In places the subsoil is loam and contains about the same amount of clay as the surface layer.

Included with this soil in mapping are small areas of Arnegard, Belfield, Lantry, and Vebar soils, which make up about 15 percent of the unit. The moderately well drained Arnegard soils are in swales. Belfield soils are on foot slopes and in swales. They contain more sodium than the Morton soil. Lantry and Vebar soils generally are on the higher parts of the landscape. Lantry soils are calcareous at or near the surface, and Vebar soils contain more sand than the Morton soil.

This Morton soil is medium in fertility and moderate in content of organic matter. It can be easily tilled, but the surface layer tends to crust after hard rains. Rooting depth is limited by the underlying bedrock. Available water capacity and permeability are moderate. The shrink-swell potential also is moderate. Runoff is medium.

Many areas are cropped. Some remain in native grass and are used for range and hay. This soil has good potential for crops, tame pasture and hay, range, openland and rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses. It has fair to poor potential for most engineering uses.

This soil is suited to corn, small grain, alfalfa, and tame grasses. Controlling erosion and soil blowing and conserving moisture are the main concerns if the soil is cropped. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and conserve moisture. Wind stripcropping and field windbreaks help control soil blowing. Returning crop residue to the soil helps maintain fertility and tilth.

Seeding cultivated areas to suited tame pasture plants is an effective means of controlling erosion and soil blowing (fig. 8). Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

Suited trees and shrubs used as windbreaks and environmental plantings grow well on this soil. A year of fallow prior to planting a windbreak helps eliminate grasses and weeds and conserves the moisture needed for survival. Planting the trees and shrubs on the contour also helps to conserve moisture.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. The underlying bedrock is rippable and generally is not a serious problem when excavations are made for basements. Enlarging the absorption area helps to overcome the slow absorption of liquid waste and the moderate depth to bedrock in septic tank filter fields. Sewage lagoons can be constructed on the lower part of the landscape where the soil is deeper and less sloping. Sealing the sides and bottom of the lagoon helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Capability unit IIe-1; Silty range site.

McC—Morton loam, 6 to 9 percent slopes. This moderately deep, well drained, moderately sloping soil is on uplands. Individual areas are irregular in shape and range from 20 to about 100 acres in size. Slopes are smooth and convex.

Typically, the surface layer is brown loam about 7 inches thick. The subsoil is about 11 inches of friable silty clay loam. It is brown in the upper part and pale brown in the lower part. The lower part is calcareous. The underlying material to a depth of 32 inches is calcareous silty clay loam. It is light gray in the upper part and pale olive in the lower part. Pale olive, calcareous, soft siltstone is at a depth of 32 inches. In places the subsoil is loam and contains about the same amount of clay as the surface layer.

Included with this soil in mapping are small areas of Cabba, Lantry, and Vebar soils, which make up about 10 percent of the unit. Cabba and Lantry soils are on the tops and upper sides of some of the ridges and knolls. They are calcareous within 10 inches of the surface. Also, Cabba soils are less than 20 inches deep over bedrock. Vebar soils generally are on the higher parts of the landscape. They contain more sand than the Morton soil.

This Morton soil is medium in fertility and moderate in content of organic matter and can be easily tilled. Rooting depth is limited by the underlying bedrock. Available water capacity and permeability are moderate. The shrink-swell potential also is moderate. Runoff is medium.

About half the acreage is cropped. The other half remains in in native grass and is used for range. This soil has good potential for range, openland and rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses; fair potential for crops and for tame pasture and hayland; and fair to poor potential for most engineering uses.

This soil is better suited to small grain, alfalfa, and tame grasses than to a row crop, such as corn, because the hazard of erosion is severe. Controlling erosion and soil blowing and conserving moisture are the main concerns if the soil is cropped. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and conserve moisture. Wind stripcropping and field windbreaks help control soil blowing. Returning crop residue to the soil helps maintain fertility and tilth.

Seeding cultivated areas to suited tame pasture plants is an effective means of controlling erosion and soil blowing. Bunch grasses, however, should not be planted alone because of the erosion hazard. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

All climatically suited trees and shrubs used as windbreaks and environmental plantings grow well on this soil. A year of fallow prior to planting a windbreak helps eliminate grass and weeds and conserves moisture. Planting the trees and shrubs on the contour also conserves moisture and helps to control erosion.

If buildings are constructed on this soil, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling. The underlying bedrock is rippable and generally is not a serious problem when excavations for basements are made. The lower parts of the landscape where the soil is deeper and less sloping are the best sites for waste disposal systems. Enlarging the absorption area helps to overcome the slow absorption of liquid waste and the moderate depth to bedrock in septic tank filter fields. Sealing the sides and bottom of sewage lagoons helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Roadside erosion-control measures reduce the risk of erosion in borrow and cut areas. Capability unit IIIe-1; Silty range site.

MdC—Morton-Lantry loams, 2 to 9 percent slopes. This map unit consists of moderately deep, well drained, gently sloping to moderately sloping soils on uplands. Slopes dominantly are 2 to 6 percent but range to 9 percent in most areas. Individual areas are irregular in shape and range from 30 to about 800 acres in size. They are about 55 percent Morton soil and 25 percent Lantry soil. The Morton soil is on the mid and lower parts of the landscape and generally has slopes of less than 6 percent. The Lantry soil is on the tops and upper sides of ridges and knolls (fig. 9) and commonly has slopes of 6 to 9 percent. The two soils are so intermingled that it is not practical to separate them in mapping. In some cultivated areas, the soils are moderately eroded.

Typically, the Morton soil has a surface layer of brown loam about 7 inches thick. The subsoil is about 11 inches of friable silty clay loam. It is brown in the upper part and pale brown in the lower part. The lower part is calcareous. The underlying material to a depth of 32 inches is calcareous silty clay loam. It is light gray in the upper part and pale olive in the lower part. Pale olive, calcareous, soft siltstone is at a depth of 32 inches. In some places on the lower part of the landscape, the depth to siltstone is more than 40 inches. In places the subsoil contains more clay than is typical for Morton soils.

Typically, the Lantry soil has a surface layer of grayish brown loam about 2 inches thick. The subsoil is about 9 inches of light brownish gray, very friable loam and silt loam. The underlying material to a depth of 26 inches is light brownish gray silt loam. Light brownish gray, calcareous, soft siltstone and sandstone are at a depth of 26 inches. The soil is calcareous throughout. In places the depth to bedrock is slightly more than 40 inches.

Included with these soils in mapping are small areas of Arnegard, Belfield, Cabba, Cohagen, Grail, Tally, and Vebar soils, which make up about 20 percent of the unit. Arnegard, Grail, and Tally soils are in swales. Arnegard and Grail soils have dark colored layers more than 16 inches thick, and the deep Tally soils contain more sand than the Morton soil. Belfield soils are along drainageways. They contain more sodium than the Morton soil. The shallow Cabba and Cohagen soils are on some of the ridges. Vebar soils are intermingled with the Morton soil. They contain more sand.

The Morton soil is medium in fertility and moderate in content of organic matter. The Lantry soil is low in fertility and moderately low in content of organic matter. Available water capacity is moderate in the Morton soil and low in the Lantry soil. The rooting depth in both soils is limited by the moderate depth to bedrock. Permeability is moderate. The shrink-swell potential also is moderate. Runoff is medium.

Many areas are farmed. Some remain in native grass and are used for range. These soils have good potential for range; fair to good potential for crops, tame pasture and hayland, rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses; and fair to poor potential for most engineering uses. The potential for openland wildlife habitat is good on the Morton soil and poor on the Lantry soil.

These soils are suited to corn, small grain, alfalfa, and tame grasses, but annual crops grow poorly on the Lantry soil. Controlling erosion and soil blowing, conserving moisture, and maintaining fertility are the main concerns if the soils are cropped. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and conserve moisture. Wind stripcropping helps control soil blowing. Returning crop residue to the soils helps maintain fertility and tilth. Planting green manure crops and applying animal manure improve the fertility of the Lantry soil.

Seeding cultivated areas to suited tame pasture plants is an effective means of controlling erosion and soil blowing. Bunch grasses should not be planted alone in areas where slopes are more than 6 percent because the hazard of erosion is severe. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

These soils are well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

Windbreaks and environmental plantings can be established on the Morton soil. Suited trees and shrubs can be planted on the Lantry soil, but growth and survival are less than optimum. A year of fallow prior to planting a windbreak helps eliminate grass and weeds and conserves needed moisture. Planting the trees and shrubs on the contour also conserves moisture and helps to control erosion.

If buildings are constructed on these soils, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling. The underlying bedrock is rippable and generally is not a serious problem when excavations for basements are made. The lower parts of the landscape where the soils generally are deeper and less sloping are the best sites for waste disposal systems. Enlarging the absorption area helps to overcome the slow absorption of liquid waste and the moderate depth to bedrock in septic tank filter fields. Sealing the sides and bottom of sewage lagoons helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Erosion in borrow and cut areas on the higher parts of the landscape can be controlled by roadside erosion-control measures. Morton soil in capability unit IIe-1, Silty range site; Lantry soil in capability unit IVe-3, Thin Upland range site.

MdD—Morton-Lantry loams, 6 to 15 percent slopes. This map unit consists of moderately deep, well drained, moderately sloping to strongly sloping soils on uplands. Slopes are dominantly 6 to 10 percent but are as much as 15 percent in most areas. Individual areas are irregularly shaped and range from 30 to about 500 acres in size. They are about 40 percent Morton soil and 35 percent Lantry soil. The Morton soil is on the mid and lower parts of the landscape and generally has slopes of less than 10 percent. The Lantry soil is generally above the Morton soil on the tops and upper sides of ridges and on the shoulders of drainageways. The two soils are so intermingled that it is not practical to separate them in mapping. In cultivated areas these soils generally are moderately eroded.

Typically, the Morton soil has a surface layer of brown loam about 4 inches thick. The subsoil is about 9 inches of friable silty clay loam. It is brown in the upper part and pale brown in the lower part. The lower part is calcareous. The underlying material to a depth of 32 inches is calcareous silty clay loam. It is light gray in the upper part and pale olive in the lower part. Pale olive, calcareous, soft siltstone is at a depth of 32 inches. In places the subsoil contains more clay than is typical for Morton soils. In some areas the depth to siltstone is more than 40 inches.

Typically, the Lantry soil has a surface layer of grayish brown loam about 2 inches thick. The subsoil is about 9 inches of light brownish gray, very friable loam and silt loam. The underlying material to a depth of 26 inches is light brownish gray silt loam. Light brownish gray, calcareous, soft siltstone and sandstone are at a depth of 26 inches. The soil is calcareous throughout. In places the depth to bedrock is slightly more than 40 inches.

Included with these soils in mapping are small areas of Arnegard, Belfield, Cabba, Cohagen, Daglum, Grail, Rhoades, Vebar, and Wayden soils, which make up about 25 percent of the unit. The deep Arnegard and Grail soils are in swales. They have dark layers more than 16 inches thick. Belfield, Daglum, and Rhoades soils are on foot slopes and along drainageways. They have a claypan subsoil and contain more sodium than the Morton soil. The shallow Cabba, Cohagen, and Wayden soils are on some of the ridges. Vebar soils are intermingled with the Morton soil. They contain more sand.

The Morton soil is medium in fertility and moderate in content of organic matter. The Lantry soil is low in fertility and moderately low in content of organic matter. Available water capacity is moderate in the Morton soil and low in the Lantry soil. The rooting depth in both soils is limited by the moderate depth to bedrock. Permeability is moderate. The shrink-swell potential also is moderate. Runoff is medium.

Many areas remain in native grass and are used for range. Some are farmed. These soils have good potential for range; fair to good potential for rangeland wildlife habitat; fair potential for crops and tame pasture and hayland; and fair to poor potential for openland wildlife habitat, windbreaks and environmental plantings, and most recreation and engineering uses.

These soils are well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

In most areas the Lantry soil is too steep and erodible for cultivation, but the Morton soil is suited to small grain, alfalfa, and tame grasses where the slope is 9 percent or less. Controlling erosion and soil blowing and conserving moisture are the main concerns if the soils are cropped. Stubble mulch, crop residue management, minimum tillage, close-sown crops, contour farming, terraces, and grassed waterways help control erosion and soil blowing and conserve moisture. Returning crop residue to the soils helps maintain fertility and tilth.

Seeding cultivated areas to tame pasture plants helps control erosion and soil blowing. Bunch grasses should not be planted alone because the hazard of erosion is severe. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

Windbreaks can be established on the Morton soil. A year of fallow prior to planting the windbreak helps eliminate grass and weeds and conserves moisture. Planting the trees and shrubs on the contour also conserves moisture and helps to control erosion. The Lantry soil generally is not suited to windbreaks, but environmental plantings can be made if special care is given and if optimum growth is not expected or required.

If buildings are constructed on these soils, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling. The underlying bedrock is rippable and generally is not a serious problem when excavations for basements are made. The lower parts of the landscape where the soils are deeper and less sloping are the best sites for waste disposal systems. Enlarging the absorption area helps to overcome the slow absorption of liquid waste and the moderate depth to bedrock in septic tank filter fields. Sealing the sides and bottom of sewage lagoons helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Roadside erosion-control measures are needed in borrow and cut areas. Low strength limits the ability of these soils to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Morton soil in capability unit IIIe-1, Silty range site; Lantry soil in capability unit VIe-3, Thin Upland range site.

MeD—Morton-Rhoades loams, 6 to 15 percent slopes. This map unit consists of moderately deep and deep, well drained and moderately well drained, moderately sloping and strongly sloping soils on uplands. Individual areas are irregular in shape and range from 20 to 500 acres in size. They are about 65 percent Morton soil and 20 percent Rhoades soil. The well drained Morton soil is on the mid and higher parts of the landscape and has smooth, convex slopes. The moderately well drained Rhoades soil commonly is on foot slopes and in swales on the lower part of the landscape but also is in scattered sags on hillsides and in saddles on ridgetops. The two soils are so closely intermingled that it is not practical to separate them in mapping.

Tyically, the Morton soil has a surface layer of brown loam about 5 inches thick. The subsoil is about 11 inches of friable silty clay loam. It is brown in the upper part and pale brown in the lower part. The lower part is calcareous. The underlying material to a depth of 32 inches is calcareous silty clay loam. It is light gray in the upper part and pale olive in the lower part. Pale olive, calcareous, soft siltstone is at a depth of 32 inches. In places the subsoil is loam and contains about the same amount of clay as the surface layer.

Typically, the Rhoades soil has a surface layer of light brownish gray loam about 4 inches thick. The subsoil is about 15 inches thick. It is grayish brown, firm clay loam in the upper part and grayish brown, firm silty clay in the lower part. The underlying material to a depth of 43 inches is light yellowish brown, calcareous silty clay loam that has spots of gypsum and other salts. Light yellowish brown, calcareous siltstone is at a depth of 43 inches.

Included with these soils in mapping are small areas of Belfield, Cabba, Cohagen, Daglum, Lantry, and Vebar soils, which make up about 15 percent of the unit. Belfield and Daglum soils are near the Rhoades soil on the lower parts of the landscape. They have a thicker surface layer and are deeper over a claypan subsoil than the Rhoades soil. Cabba, Cohagen, and Lantry soils are on the higher parts of the landscape. Cabba and Cohagen soils are less than 20 inches deep over bedrock. Lantry soils are calcareous at or near the surface. Vebar soils are intermingled with the Morton soil. They contain more sand.

The Morton soil is medium in fertility and moderate in content of organic matter. The Rhoades soil is low in fertility and moderate in content of organic matter. It is in poor tilth and is difficult to work. The claypan subsoil releases moisture slowly to plants and restricts roots. Available water capacity is moderate in the Morton soil and low in the Rhoades soil. Permeability is moderate in the Morton soil and very slow in the Rhoades soil. The shrink-swell potential is moderate in the Morton soil and high in the Rhoades soil. Runoff is medium.

Most areas remain in native grass and are used for range. The Morton soil has good potential for range and rangeland wildlife habitat and fair potential for crops, tame pasture and hayland, windbreaks and environmental plantings, and most recreation uses. This unit is adversely affected, however, by the poor potential of the Rhoades soil for these uses. The Morton soil has fair potential and the Rhoades soil poor potential for most engineering uses.

These soils are best suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Under these conditions, a considerable amount of bare ground is evident on the Rhoades soil. Proper grazing use and deferred grazing help maintain or improve the range condition.

If slopes are less than 9 percent, the Morton soil can be used for small grain, alfalfa, and tame grasses, but in many areas it is so intermingled with the Rhoades soil that farming is not practical. Suited tame pasture plants grow well on the Morton soil but grow poorly on the Rhoades soil. Because of the limitations of the Rhoades soil, range seeding generally is the preferred method of establishing a grass cover in areas that have been farmed or otherwise disturbed.

Environmental plantings can be established on the Morton soil, but windbreaks generally are not feasible on this unit because trees and shrubs grow poorly on the Rhoades soil.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. The underlying bedrock is rippable and generally is not a serious problem when excavations for basements are made. Septic tank absorption fields generally function better on the Morton soil, but the absorption area should be enlarged to overcome the slow absorption of liquid waste and the moderate depth to bedrock. The areas of less sloping Rhoades soil on the lower part of the landscape are the best sites for sewage lagoons.

Local roads and streets should be graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening or replacing the base material helps to overcome this limitation. Roadside erosion-control measures are needed in borrow and cut areas. Morton soil in capability unit IVe-1, Silty range site; Rhoades soil in capability unit VIs-1, Thin Claypan range site.

Pa—Parshall fine sandy loam, 0 to 6 percent slopes. This deep, well drained, nearly level to undulating soil is on high terraces. Individual areas are irregular in shape and range from 15 to about 100 acres in size. Slopes are mostly less than 2 percent but range to 6 percent in areas where the soil is undulating. They are steeper on the short terrace fronts in some included areas.

Typically, the surface layer is grayish brown fine sandy loam about 5 inches thick. The subsurface layer is brown, very friable fine sandy loam about 8 inches thick. The subsoil is about 21 inches of grayish brown, very friable fine sandy loam. To a depth of 58 inches, the underlying material is grayish brown sandy loam. Below this to a depth of 60 inches, it is light brownish gray, calcareous sandy loam. In places the subsurface layer and subsoil are lighter colored than is typical for Parshall soils.

Included with this soil in mapping are small areas of Manning, Shambo, and Wabek soils, which make up less than 15 percent of the unit. Manning soils are on slight rises. They have sand and gravel within a depth of 40 inches. Shambo soils are intermingled with the Parshall soil. They have a texture of loam. Wabek soils are on short terrace fronts. They are less than 14 inches deep to sand and gravel.

This Parshall soil is medium in fertility and moderate in content of organic matter and can be easily tilled throughout a wide range in moisture content. Available water capacity is moderate or high, and permeability is moderately rapid. The shrink-swell potential is low. Runoff is slow.

Many areas are farmed. Some remain in native grass and are used for range. This soil has good potential for crops, tame pasture and hayland, range, rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation and engineering uses. It has fair potential for openland wildlife habitat.

This soil is suited to corn, small grain, alfalfa, and tame grasses. Spring-sown small grain is better suited than winter wheat because the hazard of soil blowing is severe. Controlling soil blowing and conserving moisture are the main concerns if the soil is cropped. Stubble mulch, crop residue management, minimum tillage, wind stripcropping, and field windbreaks help control soil blowing and conserve moisture. Returning crop residue to the soil helps maintain fertility and tilth.

Seeding cultivated areas to suited tame pasture plants is an effective means of controlling soil blowing. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is a mixture of tall, mid, and short grasses. Management that maintains an adequate plant cover and ground mulch helps control soil blowing and improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Under such conditions, there is some risk of soil blowing around water facilities and along livestock trails. Proper grazing use and deferred grazing help maintain or improve the range condition and control soil blowing.

This soil is well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Keeping a mulch of crop residue on the surface during site preparation helps control soil blowing.

The limitations of this soil as a site for buildings and septic tank absorption fields are slight. The effluent from septic tank absorption fields, however, can pollute shallow ground water. Excessive seepage is a limitation if this soil is a site for sewage lagoons. It can be partly overcome by sealing the sides and bottom of the lagoons.

Local roads and streets should be graded to shed water. Keeping moisture away from the subgrade helps to prevent the road damage caused by frost action. The borrow and cut areas of newly graded roads should be smoothed and seeded immediately to prevent excessive soil blowing. This soil has fair potential for irrigation. Capability unit IIIe-7; Sandy range site.

Pb—Psamments. This map unit consists of deep, excessively drained, undulating to rolling sandy soils that mainly are on bottom land along rivers. Typically, it is active dunes and blowouts that support little or no vegetation. The surface is hummocky. Slopes are short and convex and range from 0 to 15 percent. Individual areas are irregular in shape and range from 10 to 100 acres in size. Some areas are subject to flooding.

Typically, the surface layer is calcareous fine sand. The underlying material is dominantly calcareous fine sand but in places is stratified with layers of coarse sand and very fine sand.

Included with these soils in mapping are small areas of Banks and Trembles soils, which make up less than 15 percent of the unit. These included soils generally are in smooth areas between mounds. They contain slightly more fine earth than the Psamments.

Psamments generally are low in fertility and content of organic matter. Available water capacity is low, and permeability is rapid. Runoff is slow.

Psamments support little or no vegetation. They have very poor potential for most uses. The main concern of management is arresting the enlargement of these areas and establishing a plant cover by applying dune stabilization measures and by fencing out livestock. Capability unit VIIIe-1; not assigned to a range site.

RaA—Reeder loam, 0 to 2 percent slopes. This moderately deep, well drained, nearly level soil is on uplands. Individual areas are irregular in shape and range from 20 to about 100 acres in size. Slopes are plane to slightly convex.

Typically, the surface layer is dark grayish brown loam about 5 inches thick. The subsoil is about 23 inches of friable clay loam. It is brown in the upper part, light olive brown in the next part, and light yellowish brown in the lower part. The lower part is calcareous and has spots and streaks of lime. The underlying material to a depth of 32 inches is pale yellow, calcareous loam. Pale olive and light yellowish brown, calcareous, soft sandstone is at a depth of 32 inches. In places, the surface layer is fine sandy loam and the subsoil is sandy clay loam. In some areas the subsoil contains more clay than is typical for Reeder soils. On some of the very slight rises, it is loam and has about the same content of clay as the surface layer.

Included with this soil in mapping are small areas of Arnegard, Belfield, Rhoades, and Vebar soils, which make up about 10 percent of the unit. Arnegard, Belfield, and Rhoades soils are in shallow swales and along drainageways. Arnegard soils have a thicker surface layer than the Reeder soil, and Belfield and Rhoades soils have a claypan subsoil and contain more sodium than the Reeder soil. Vebar soils are on some of the slight rises. They contain more sand than the Reeder soil.

This Reeder soil is medium in fertility and moderate in content of organic matter and can be easily tilled throughout a wide range in moisture content. Available water capacity is low. The rooting depth is limited by the moderate depth to bedrock. Permeability is moderate. The shrink-swell potential also is moderate. Runoff is slow.

Most areas are farmed. This soil has good potential for crops, tame pasture and hayland, range, openland and rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses. It has fair to poor potential for most engineering uses.

This soil is suited to corn, small grain, alfalfa, and tame grasses. The periodic shortage of moisture common to the climate is the main concern if the soil is cropped. The hazard of soil blowing is slight to moderate. Stubble mulch, crop residue management, and minimum tillage help conserve moisture and control soil blowing. Wind stripcropping and field windbreaks also help control soil blowing. Returning crop residue to the soil helps maintain fertility and tilth.

All climatically suited tame pasture plants grow well on this soil. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

This soil is well suited to windbreaks and environmental plantings. A year of fallow prior to planting the windbreak helps eliminate grass and weeds and conserves needed moisture.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Enlarging the absorption area helps to overcome the slow absorption of liquid waste and the moderate depth to bedrock in septic tank filter fields. Because of lateral seepage above the bedrock, the effluent can pollute shallow ground water. Sewage lagoons can be constructed on this soil if the floor is above the bedrock and the sides and bottom are sealed to prevent excessive seepage.

Local roads should be graded to shed water. Keeping moisture away from the subgrade helps to prevent the road damage caused by frost action and by shrinking and swelling. Capability unit IIc-2; Silty range site.

RaC—Reeder loam, 6 to 9 percent slopes. This moderately deep, well drained, moderately sloping soil is on uplands. Individual areas are irregular in shape and range from 20 to about 100 acres in size. Slopes are smooth and convex.

Typically, the surface layer is dark grayish brown loam about 5 inches thick. The subsoil is about 23 inches of friable clay loam. It is brown in the upper part, light olive brown in the next part, and light yellowish brown in the lower part. The lower part is calcareous and has spots and streaks of lime. The underlying material to a depth of 32 inches is pale yellow, calcareous loam. Pale olive and light yellowish brown, calcareous, soft sandstone is at a depth of 32 inches. In some places, the surface layer is fine sandy loam and the subsoil is sandy clay loam. In others the subsoil is loam and has about the same content of clay as the surface layer.

Included with this soil in mapping are small areas of Cabba, Lantry, and Vebar soils, which make up less than 10 percent of the unit. The shallow Cabba soils and the Lantry soils are on the tops and upper sides of some of the ridges. Lantry soils are calcareous within 10 inches of the surface. Vebar soils are intermingled with the Reeder soil. They contain more sand.

This Reeder soil is medium in fertility and moderate in content of organic matter and can be easily tilled throughout a wide range in moisture content. Available water capacity is low, and the soil is somewhat droughty. The rooting depth is limited by the moderate depth to bedrock. Permeability is moderate. The shrink-swell potential also is moderate. Runoff is medium.

Many areas remain in native grass and are used for range. Some areas are farmed. This soil has good potential for range, openland and rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses; fair potential for crops and for tame pasture and hayland; and fair to poor potential for most engineering uses.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

This soil is better suited to small grain, alfalfa, and tame grasses than to a row crop, such as corn, because the erosion hazard is severe. Controlling erosion and soil blowing and conserving moisture are the main concerns if the soil is cropped. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and conserve moisture. Wind stripcropping and field windbreaks help control soil blowing. Returning crop residue to the soil helps maintain fertility and tilth.

Seeding cultivated areas to suited tame pasture plants is an effective means of controlling erosion and soil blowing. Bunch grasses should not be planted alone because of the severe erosion hazard. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

All climatically suited trees and shrubs used as windbreaks and environmental plantings grow well on this soil. A year of fallow prior to planting a windbreak helps eliminate grass and weeds and conserves moisture. Planting the trees and shrubs on the contour also conserves moisture and helps to control erosion.

If buildings are constructed on this soil, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling. The lower parts of the landscape where the soils are deeper and less sloping are the best sites for waste disposal systems. Enlarging the absorption area in septic tank filter fields helps to overcome the slow absorption of liquid waste and the moderate depth to bedrock. Because of lateral seepage above the bedrock, the effluent can pollute shallow ground water. Sealing the sides and bottom of the lagoon helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Keeping moisture away from the subgrade helps to prevent the road damage caused by frost action and by shrinking and swelling. Roadside erosion-control measures are needed in borrow and cut areas. Capability unit IIIe-1; Silty range site.

RbB—Reeder-Amor loams, 2 to 6 percent slopes. This map unit consists of moderately deep, well drained, gently sloping soils on uplands. Slopes are smooth and convex. Areas are irregularly shaped and range from 20 to about 200 acres in size. They are about 60 percent Reeder soil and 25 percent Amor soil. The Amor soil generally is on the higher part of the landscape. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Reeder soil has a surface layer of dark grayish brown loam about 5 inches thick. The subsoil is about 23 inches of friable clay loam. It is brown in the upper part, light olive brown in the next part, and light yellowish brown in the lower part. The lower part is calcareous and has spots and streaks of lime. The underlying material to a depth of 32 inches is pale yellow, calcareous loam. Pale olive and light yellowish brown, calcareous, soft sandstone is at a depth of 32 inches. On the lower part of the landscape, the depth to sandstone is more than 40 inches. In places the subsoil contains more clay than is typical for Reeder soils. In some areas, the surface layer is fine sandy loam and the subsoil is sandy clay loam.

Typically, the Amor soil has a surface layer of dark grayish brown loam about 8 inches thick. The subsoil is about 17 inches of friable loam. It is brown in the upper part and light brownish gray in the lower part. The lower part is calcareous and has spots and streaks of lime that extend into the underlying material. The underlying material to a depth of 34 inches is light yellowish brown, calcareous loam. Light yellowish brown, soft loamy siltstone is at a depth of 34 inches.

Included with these soils in mapping are small areas of Arnegard, Belfield, Lantry, and Vebar soils, which make up about 15 percent of the unit. Arnegard and Belfield soils are in narrow swales and along drainageways. Arnegard soils have a thicker surface layer than the Amor and Reeder soils, and Belfield soils have a claypan subsoil and contain more sodium than the Amor and Reeder soils. Lantry soils are on the tops and upper sides of ridges and knolls. They are calcareous within a depth of 10 inches. Vebar soils are interminged with the Amor soil. They contain more sand.

The Reeder and Amor soils are medium in fertility and moderate in content of organic matter and can be easily tilled throughout a wide range in moisture content. Available water capacity is low or moderate, and the soils are somewhat droughty. The rooting depth in both soils is limited by the moderate depth to bedrock. Permeability is moderate. The shrink-swell potential also is moderate. Runoff is medium.

Most areas are farmed. These soils have good potential for crops, tame pasture and hayland, range, openland and rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses. It has fair to poor potential for most engineering uses.

These soils are suited to corn, small grain, alfalfa, and tame grasses. Controlling erosion and soil blowing and conserving moisture are the main concerns if the soils are cropped. Stubbble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and conserve moisture. Wind stripcropping and field windbreaks help control soil blowing. Returning crop residue to the soils helps maintain fertility and tilth.

Seeding cultivated areas to suited tame pasture plants is an effective means of controlling erosion and soil blowing. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

These soils are well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasss lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

Suited trees and shrubs used as windbreaks and environmental plantings grow well on these soils. A year of fallow prior to planting a windbreak helps eliminate grass and weeds and conserves moisture. Planting the trees and shrubs on the contour also conserves moisture and helps to control erosion.

If buildings are constructed on these soils, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling. The lower parts of the landscape where the soils tend to be deeper and less sloping are the best sites for waste disposal systems. Enlarging the absorption area in septic tank filter fields helps to overcome the slow absorption of liquid waste and the moderate depth to bedrock. Because of lateral seepage above the bedrock, the effluent can pollute shallow ground water. Sealing the sides and bottom of sewage lagoons helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Keeping moisture away from the subgrade helps to prevent the road damage caused by shrinking and swelling and by frost action. Capability unit IIe-1; Silty range site.

RcC—Reeder-Lantry loams, 2 to 9 percent slopes. This map unit consists of moderately deep, well drained, gently sloping and moderately sloping soils on uplands. Individual areas are irregular in shape and range from 20 to about 800 areas in size. They are about 60 percent Reeder soil and 30 percent Lantry soil. The Reeder soil is on the mid and lower parts of the landscape and has smooth slopes that are dominantly less than 6 percent. The Lantry soil is on the tops and upper sides of ridges and knolls and has slopes of as much as 9 percent. The two soils are so intermingled that it is not practical to separate them in mapping. In some cultivated areas they are moderately eroded.

Typically, the Reeder soil has a surface layer of dark grayish brown loam about 5 inches thick. The subsoil is about 23 inches of friable clay loam. It is brown in the upper part, light olive brown in the next part, and light yellowish brown in the lower part. The lower part is calcareous and has spots and streaks of lime. The underlying material to a depth of 32 inches is pale yellow, calcareous loam. Pale olive and light yellowish brown, calcareous, soft sandstone is at a depth of 32 inches. In some places the subsoil is loam and has about the same content of clay as the surface layer. In others it is silty clay loam. In some areas it contains more clay than is typical for Reeder soils.

Typically, the Lantry soil has a surface layer of grayish brown loam about 2 inches thick. The subsoil is about 9 inches of light brownish gray, very friable loam and silt loam. The underlying material to a depth of 26 inches is light brownish gray silt loam. Light brownish gray, calcareous, soft siltstone and sandstone are at a depth of 26 inches. The soil is calcareous throughout. In places the depth to bedrock is more than 40 inches, and on some of the ridges it is slightly less than 20 inches. In some areas the soil contains more sand than is typical for Lantry soils.

Included with these soils in mapping are small areas of Arnegard, Belfield, Cohagen, Grail, Rhoades, and Vebar soils, which make up about 10 percent of the unit. Arnegard and Grail soils are in swales. They have dark colored layers more than 16 inches thick. Belfield and Rhoades soils are on foot slopes and along drainageways. They have a claypan subsoil and a significant amount of sodium. The shallow Cohagen soils are on sandy ridgetops. Vebar soils are intermingled with the Reeder soil. They contain more sand.

The Reeder soil is medium in fertility and moderate in content of organic matter. The Lantry soil is low in fertility and moderately low in content of organic matter. Both soils are somewhat droughty. Available water capacity is low. The rooting depth in both soils is limited by the moderate depth to bedrock. Permeability is moderate. The shrink-swell potential also is moderate. Runoff is medium.

Many areas are farmed. Some remain in native grass and are used for range. These soils have good potential for range; fair to good potential for crops, tame pasture and hayland, rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses; and fair to poor potential for most engineering uses. The potential for openland wildlife habitat is good on the Reeder soil and poor on the Lantry soil.

These soils are suited to corn, small grain, alfalfa, and tame grasses, but annual crops grow poorly on the Lantry soil. Controlling erosion and soil blowing, conserving moisture, and maintaining fertility are the main concerns if the soils are cropped. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and conserve moisture. Wind stripcropping helps control soil blowing. Returning crop residue to the soils helps maintain fertility and tilth. Planting green manure crops and applying animal manure improve the fertility of the Lantry soil.

Seeding cultivated areas to suited tame pasture plants is an effective means of controlling erosion and soil blowing. Bunch grasses should not be planted alone in areas where slopes are more than 6 percent because the erosion hazard is severe. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

These soils are well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable plants lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

Windbreaks and environmental plantings can be established on the Reeder soil. Suited trees and shrubs can be planted on the Lantry soil, but growth and survival are less than optimum. A year of fallow prior to planting a windbreak helps eliminate grass and weeds and conserves needed moisture. Planting the trees and shrubs on the contour also conserves moisture and helps to control erosion.

If buildings are constructed on these soils, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling. The underlying bedrock is rippable and generally is not a serious problem when excavations for basements are made. The lower parts of the landscape where the soils generally are deeper and less sloping are the best sites for waste disposal systems. Enlarging the absorption area in septic tank filter fields helps to overcome the slow absorption of liquid waste and the moderate depth to bedrock. Because of lateral seepage above the bedrock, the effluent can pollute shallow ground water. Sealing the sides and bottom of sewage lagoons helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Keeping moisture away from the subgrade helps to prevent the road damage caused by shrinking and swelling and by frost action. Roadside erosion-control measures are needed in borrow and cut areas on the higher part of the landscape. Reeder soil in capability unit IIe-1, Silty range site; Lantry soil in capability unit IVe-3, Thin Upland range site.

RdB—Reeder-Rhoades loams, 2 to 6 percent slopes. This map unit consists of moderately deep, well drained, gently sloping soils and deep, moderately well drained, gently sloping soils that have a claypan subsoil. It is on gentle rises and in swales on uplands. Individual areas are irregular in shape and range from 20 to about 100 acres in size. They are about 50 to 70 percent Reeder soil and 20 to 40 percent Rhoades soil. The moderately deep Reeder soil is on the gentle rises. The deep Rhoades soil is on foot slopes and in swales. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Reeder soil has a surface layer of dark grayish brown loam about 5 inches thick. The subsoil is about 23 inches of friable clay loam. It is brown in the upper part, light olive brown in the next part, and light yellowish brown in the lower part. The lower part is calcareous and has spots and streaks of lime. The underlying material to a depth of 32 inches is pale yellow, calcareous loam. Pale olive and light yellowish brown, calcareous, soft sandstone is at a depth of 32 inches. In some places on the lower part of the landscape, the depth to bedrock is more than 40 inches. In places the soil contains less sand and more silt than is typical for Reeder soils, and in some areas the subsoil contains more clay. On the higher parts of the landscape, the subsoil is loam and has about the same content of clay as the surface layer.

Typically, the Rhoades soil has a surface layer of light brownish gray loam about 4 inches thick. The subsoil is about 15 inches thick. It is grayish brown, firm clay loam in the upper part and grayish brown, firm silty clay in the lower part. The underlying material to a depth of 43 inches is light yellowish brown, calcareous silty clay loam that has spots of gypsum and other salts. Light yellowish brown, calcareous siltstone is at a depth of 43 inches.

Included with these soils in mapping are small areas of Belfield, Daglum, Grail, Lantry, and Vebar soils, which make up about 10 percent of the unit. Belfield, Daglum, and Grail soils are on foot slopes and in swales. Belfield and Daglum soils have a thicker surface layer and are deeper over a claypan subsoil than the Rhoades soil, and the moderately well drained Grail soil has dark colored layers more than 16 inches thick and contains less sodium than the Rhoades soil. Lantry soils are on ridgetops. They are calcareous within a depth of 10 inches. Vebar soils are intermingled with the Reeder soil. They contain more sand.

The Reeder soil is medium in fertility and moderate in content of organic matter and can be easily worked throughout a wide range in moisture content. The Rhoades soil is low in fertility and moderate in content of organic matter and is difficult to work. Available water capacity is low in both soils. The rooting depth is limited by the moderate depth to bedrock in the Reeder soil and by the claypan subsoil in the Rhoades soil. The claypan subsoil in the Rhoades soil releases moisture slowly to plants. Permeability is moderate in the Reeder soil and very slow in the Rhoades soil. The shrink-swell potential is moderate in the Reeder soil and high in the Rhoades soil. Runoff is medium.

About half of the acreage is cropped. The other half remains in native grass and is used for range. The Reeder soil has good potential for crops, tame pasture and hayland, range, openland and rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses, but this unit is adversely affected by the poor potential of the Rhoades soil for all of these uses. The potential for most engineering uses is fair to poor.

These soils are better suited to small grain and tame grasses than to corn and alfalfa because of the poor potential of the Rhoades soil. Crop growth is uneven. Controlling erosion and soil blowing, conserving moisture, and improving water intake in the Rhoades soil are the main concerns if crops are grown. Stubble mulch, crop residue management, minimum tillage, and grassed waterways help control erosion. Wind stripcropping helps control soil blowing. Unless slopes are too irregular, contour farming and terracing can help to prevent the accumulation of runoff on the Rhoades soil. Returning crop residue to the soils and applying animal manure help maintain or improve fertility and tilth.

Suited tame pasture plants grow well on the Reeder soil but poorly on the Rhoades soil. As a result, range seeding is the preferred method of establishing a grass cover in areas that have been farmed or otherwise disturbed.

Because the soils are intermingled, they are best suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Under these conditions, undesirable plants and a considerable amount of bare ground are evident on the Rhoades soil. Proper grazing use and deferred grazing help maintain or improve the range condition.

Windbreaks and environmental plantings can be established on the Reeder soil. Trees and shrubs grow poorly on the Rhoades soil and seldom survive. If the two soils are closely intermingled, windbreaks should not be planted on this unit.

The Reeder soil is a better building site than the Rhoades soil. Proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling. Both soils are poorly suited as septic tank absorption fields, but the Reeder soil generally is better suited than the Rhoades soil. Enlarging the absorption area helps to overcome the slow absorption of liquid waste and the moderate depth to bedrock in the Reeder soil. Because of lateral seepage above the bedrock, the effluent can pollute shallow ground water. The Rhoades soil is better than the Reeder soil as a site for sewage lagoons.

Local roads and streets should be graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Keeping moisture away from the subgrade helps to prevent the road damage caused by frost action and by shrinking and swelling. Reeder soil in capability unit IIe-1, Silty range site; Rhoades soil in capability unit VIs-1, Thin Claypan range site.

ReB—Regent-Daglum complex, 2 to 6 percent slopes. This map unit consists of moderately deep and deep, well drained and moderately well drained, gently sloping soils on uplands, typically on gentle rises and in narrow swales. Individual areas are irregular in shape and range from 20 to about 400 acres in size. They are about 65 percent Regent soil and 25 percent Daglum soil. The Regent soil is on the gentle rises, and the Daglum soil is on foot slopes and in swales. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Regent soil has a surface layer of dark grayish brown silty clay loam about 5 inches thick. The subsoil is about 23 inches of firm silty clay loam. It is grayish brown in the upper part and light brownish gray in the lower part. The lower part is calcareous and has spots and streaks of lime that extend into the underlying material. The underlying material to a depth of 35 inches is light brownish gray, calcareous silty clay loam. Light brownish gray, calcareous, soft siltstone is at a depth of 35 inches. In some places on the lower part of the landscape, the depth to siltstone is more than 40 inches. In places the subsoil contains less clay than is typical for the Regent soil.

Typically, the Daglum soil has a surface layer of grayish brown loam about 5 inches thick. The subsurface layer is gray silt loam about 2 inches thick. The subsoil is about 10 inches of grayish brown, very firm clay and silty clay. The underlying material to a depth of 60 inches is grayish brown, calcareous silty clay loam. It has spots of gypsum in the upper part. In places, the soil lacks a distinct gray subsurface layer and visible gypsum and other salts are at a greater depth than is typical for Daglum soils. In some areas the depth to bedrock is slightly less than 40 inches.

Included with these soils in mapping are small areas of Farnuf, Grail, and Rhoades soils, which make up less than 10 percent of the unit. These included soils are in some of the swales and along drainageways. The deep Farnuf soil contains less clay in the subsoil than the Regent soil. Grail soils have dark colored layers more than 16 inches thick. Rhoades soils have a thinner surface layer than the Daglum soil.

Fertility is medium in the Regent soil and low in the Daglum soil. Both soils are moderate in content of organic matter. They tend to crust after hard rains. Available water capacity is moderate. The growth of roots is limited by the moderate depth to bedrock in the Regent soil and by the claypan subsoil in the Daglum soil. Permeability is slow in the Regent soil and very slow in the Daglum soil. Both soils shrink and swell upon drying and wetting. Runoff is medium.

Many areas are farmed. Some remain in native grass and are used for range. These soils have fair to good potential for range, tame pasture, and hayland; fair potential for crops and most recreation uses; and poor potential for most engineering uses. The potential for openland and rangeland wildlife habitat and for windbreaks and environmental plantings is good on the Regent soil and poor on the Daglum soil.

These soils are better suited to small grain, alfalfa, and tame grasses than to corn. Crop growth is uneven, especially in dry years, because of the salts and sodium in the Daglum soil. Controlling erosion and soil blowing, conserving moisture, and improving tilth and water intake are the main concerns if the soils are cropped. Stubble mulch, crop residue management, minimum tillage, and grassed waterways help control erosion and conserve moisture. Contour farming and terracing help prevent the accumulation of runoff on the Daglum soil. Wind stripcropping helps control soil blowing. Returning crop residue to the soil helps maintain fertility and tilth. Chiseling or subsoiling temporarily improves water intake in the Daglum soil.

Seeding cultivated areas to suited tame pasture plants is an effective means of controlling erosion and soil blowing. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

Range is a good use for these soils. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

Windbreaks and environmental plantings can be established on the Regent soil. The choice of suited trees and shrubs is limited on the Daglum soil, and growth and survival are poor because of the sodium content and the dense claypan subsoil. A year of fallow prior to planting a windbreak helps eliminate grass and weeds and conserves needed moisture. Planting the trees and shrubs on the contour also conserves moisture and reduces the risk of erosion.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Enlarging the absorption area in septic tank filter fields helps to overcome the slow absorption of liquid waste. The lower parts of the landscape where the soils are less sloping are the best sites for sewage lagoons.

Local roads and streets should be graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening or replacing the base material helps to overcome this limitation. Regent soil in capability unit IIe-1, Clayey range site; Daglum soil in capability unit IVs-3, Claypan range site.

RfB—Regent-Savage silty clay loams, 2 to 6 percent slopes. This map unit consists of moderately deep and deep, well drained, gently sloping soils on uplands. Individual areas are irregular in shape and range from 15 to 200 acres in size. They are about 65 percent Regent soil and 25 percent Savage soil. The Regent soil generally is on the mid and higher parts of the landscape. The Savage soil is on foot slopes and in swales. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Regent soil has a surface layer of dark grayish brown silty clay loam about 5 inches thick. The subsoil is about 23 inches of firm silty clay loam. It is grayish brown in the upper part and light brownish gray in the lower part. The lower part is calcareous and has spots and streaks of lime that extend into the underlying material. The underlying material to a depth of 35 inches is light brownish gray, calcareous silty clay loam. Light brownish gray, calcareous, soft siltstone is at a depth of 35 inches. On the higher parts of the landscape, the subsoil contains less clay than is typical for the Regent soil.

Typically, the Savage soil has a surface layer of grayish brown silty clay loam about 5 inches thick. The subsoil is about 22 inches of firm clay. It is dark grayish brown in the upper part, grayish brown in the next part, and light yellowish brown in the lower part. The lower part is calcareous and has spots and streaks of lime that extend into the underlying material. To a depth of 55 inches, the underlying material is light brownish gray, calcareous clay. Below this to a depth of 60 inches, it is light brownish gray, mottled, calcareous clay loam.

Included with these soils in mapping are small areas of Arnegard, Belfield, Grail, and Wayden soils, which make up about 10 percent of the unit. Arnegard and Grail soils are in swales. They have dark colored layers more than 16 inches thick. Belfield soils are on foot slopes and along drainageways. They contain more sodium than the Regent and Savage soils. The shallow Wayden soils are on the tops and upper sides of some of the ridges.

The Regent and Savage soils are medium in fertility and moderate in content of organic matter. Available water capacity is moderate in the Regent soil and high in the Savage soil. The surface layer in both soils can be easily tilled but tends to crust after hard rains. The growth of roots is limited by the moderate depth to bedrock in the Regent soil. Permeability is slow in the Regent soil and moderately slow in the Savage soil. Both soils shrink and swell upon drying and wetting. Runoff is medium.

Most areas are farmed. Some remain in native grass and are used for range and hay. These soils have good potential for crops, tame pasture and hayland, range, openland and rangeland wildlife habitat, and windbreaks and environmental plantings; fair potential for most recreation uses; and poor potential for most engineering uses.

These soils are suited to corn, small grain, alfalfa, and tame grasses. Controlling erosion and soil blowing and conserving moisture are the main management concerns if the soils are cropped. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and conserve moisture. Wind stripcropping and field windbreaks help control soil blowing. Returning crop residue to the soils helps maintain fertility and tilth.

Seeding cultivated areas to suited tame pasture plants is an effective means of controlling erosion and soil blowing. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

These soils are well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

These soils are suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. A year of fallow prior to planting a windbreak helps eliminate grass and weeds and conserves moisture. Planting the trees and shrubs on the contour also conserves moisture and reduces the risk of erosion.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. The lower parts of the landscape where the soils are deeper and less sloping are the best sites for waste disposal systems. Enlarging the absorption area helps to overcome the slow absorption of liquid waste in septic tank filter fields.

Local roads and streets should be graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Capability unit IIe-1; Clayey range site.

RhD—Regent-Wayden silty clay loams, 6 to 15 percent slopes. This map unit consists of moderately deep and shallow, well drained, moderately sloping and strongly sloping soils on uplands. Individual areas are irregular in shape and range from 15 to 50 acres in size. They are about 60 percent Regent soil and 35 percent Wayden soil. The Regent soil is on the mid and lower parts of the landscape. The Wayden soil is on the tops and upper sides of ridges and knolls or on the shoulders of entrenched drainageways. The two soils are so intermingled that it is not practical to separate them in mapping. In cultivated areas they are moderately eroded.

Typically, the Regent soil has a surface layer of dark grayish brown silty clay loam about 5 inches thick. The subsoil is about 23 inches of firm silty clay loam. It is grayish brown in the upper part and light brownish gray in the lower part. The lower part is calcareous and has spots and streaks of lime that extend into the underlying material. The underlying material to a depth of 35 inches is light brownish gray, calcareous silty clay loam. Light brownish gray, calcareous, soft siltstone is at a depth of 35 inches. In some places on the lower parts of the landscape, the depth to siltstone is more than 40 inches.

Typically, the Wayden soil has a surface layer of light yellowish brown silty clay loam about 2 inches thick. The underlying material to a depth of 13 inches is pale olive, friable silty clay loam. Light gray, soft shale is at a depth of 13 inches. The soil is calcareous throughout.

Included with these soils in mapping are small areas of the moderately well drained Grail soils in swales and along drainageways. These included soils make up about 5 percent of the unit.

The Regent soil is medium in fertility and moderate in content of organic matter, and the Wayden soil is low in fertility and in content of organic matter. Available water capacity is moderate in the Regent soil and very low in the Wayden soil. The rooting depth is limited because the soils are moderately deep or shallow over bedrock. Permeability is slow. Both soils shrink and swell upon drying and wetting. Runoff is medium to rapid.

Most areas remain in native grass and are used for range. A few areas are cultivated. These soils have good to fair potential for range and rangeland wildlife habitat; fair to poor potential for crops, tame pasture and hayland, windbreaks and environmental plantings, and most recreation uses; and poor potential for most engineering uses.

These soils are best suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

The Regent soil can be used for small grain, alfalfa, and tame grasses, but the Wayden soil is not suitable for cultivation because of shallowness, low fertility, droughtiness, and a very severe erosion hazard. In many areas the two soils are so intermingled that farming is not feasible. Stubble mulch, crop residue management, close-sown crops, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and conserve moisture in farmed areas. Returning crop residue to the soils and applying animal manure help maintain fertility and tilth.

Seeding cultivated areas to suited tame pasture plants helps prevent excessive soil losses. Bunch grasses should not be planted alone because of the erosion hazard. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established. If an area to be seeded is dominantly the Wayden soil, range seeding is the preferred method of establishing a grass cover because this soil is poorly suited to tame pasture plants.

Windbreaks and environmental plantings can be established on the Regent soil on the mid and lower parts of the landscape. The Wayden soil is not suited to windbreaks, and the trees and shrubs planted on this soil for environmental purposes grow poorly. Planting the trees and shrubs on the contour helps conserve moisture and reduces the risk of erosion.

If buildings are constructed on these soils, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling. Waste disposal systems can be constructed on the lower parts of the landscape where the soils are deeper and less sloping. Enlarging the absorption area helps to overcome the slow absorption of liquid waste in septic tank filter fields on the Regent soil.

Local roads and streets should be graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening the base material helps to overcome this limitation. The risk of erosion in borrow and cut areas can be reduced by roadside erosion-control measures. Regent soil in capability unit IIIe-1, Clayey range site; Wayden soil in capability unit VIe-12, Shallow range site.

RkD—Rhoades-Cabba loams, 2 to 25 percent slopes. This map unit consists of deep, moderately well drained, gently sloping to strongly sloping soils that have a claypan subsoil and shallow, well drained, gently sloping to moderately steep soils. It is on uplands, typically on ridges and along entrenched drainageways. Individual areas are long and narrow and range from 15 to about 100 acres in size. They are about 40 to 60 percent Rhoades soil and 15 to 35 percent Cabba soil. The Rhoades soil is on the mid and lower parts of the landscape and has concave slopes that are dominantly less than 9 percent. The Cabba soil is on the higher parts of the landscape and is mostly strongly sloping to moderately steep. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Rhoades soil has a surface layer of light brownish gray loam about 4 inches thick. The subsoil is about 15 inches thick. It is grayish brown, firm clay loam in the upper part and grayish brown, firm silty clay in the lower part. The underlying material to a depth of 43 inches is light yellowish brown, calcareous silty clay loam that has spots of gypsum and other salts. Light yellowish brown, calcareous siltstone is at a depth of 43 inches. In places the depth to bedrock is slightly less than 40 inches.

Typically, the Cabba soil has a surface layer of grayish brown loam about 3 inches thick. The underlying material to a depth of 14 inches is light brownish gray, calcareous, friable silt loam. Light gray, calcareous, soft siltstone is at a depth of 14 inches. In places the depth to soft siltstone is more than 20 inches.

Included with these soils in mapping are small areas of Amor, Belfield, and Daglum soils, Rock outcrop, and Slickspots. These included areas make up less than 25 percent of the unit. The moderately deep Amor soils are below the Cabba soil or on some of the broader ridgetops. They have a thicker surface layer than the Cabba soil and are deeper to lime. Belfield and Daglum soils are on the lower parts of the landscape. They have a thicker surface layer and are deeper over a claypan subsoil than the Rhoades soil. Rock outcrop is on the higher parts of the landscape and around the head of drainageways. It consists of eroding exposures of soft siltstone or sandstone. Slickspots are intermingled with the Rhoades soil. They have visible salts at or near the surface.

The Rhoades and Cabba soils are low in fertility and moderate to low in content of organic matter. Available water capacity is low or very low. The availability of plant nutrients is adversely affected by the sodium content in the Rhoades soil and the lime content of the Cabba soil. The rooting depth is limited by the claypan subsoil of the Rhoades soil and the shallowness to siltstone of the Cabba soil. Permeability is very slow in the Rhoades soil and moderate in the Cabba soil. The shrink-swell potential is high in the Rhoades soil and moderate in the Cabba soil. Runoff is rapid.

All areas remain in native grass and are used for range. These soils have poor to fair potential for range, rangeland wildlife habitat, and most recreation uses. They have poor potential for crops, tame pasture and hayland, windbreaks and environmental plantings, and most engineering uses.

These soils are best suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Under these conditions, a considerable amount of bare ground generally is evident. Proper grazing use and deferred grazing help maintain or improve the range condition.

These soils are not suited to crops, tame pasture and hayland, and windbreaks because of the sodium content in the Rhoades soil and the steep slopes, erodibility, and low fertility of the Cabba soil. The choice of trees and shrubs for special purpose plantings is limited, and growth and survival generally are poor.

If buildings are constructed on these soils, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling and by the unstable underlying siltstone. The lower parts of the landscape where the soils are deeper and less steep are the best sites for waste disposal systems. Enlarging the absorption area helps to overcome the slow absorption of liquid waste in septic tank filter fields.

Local roads and streets should be graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening or replacing the base material helps to overcome this limitation. The risk of erosion in borrow and cut areas can be reduced by roadside erosion-control measures. Rhoades soil in capability unit VIs-1, Thin Claypan range site; Cabba soil in capability unit VIe-11, Shallow range site.

RmC—Rhoades-Daglum-Slickspots complex, 0 to 9 percent slopes. This map unit consists of deep, moderately well drained and well drained, nearly level to moderately sloping soils that have a claypan subsoil. It is on uplands and terraces. The surface is uneven because low mounds rise a few inches above low spots. Slopes generally are less than 6 percent but are as much as 9 percent in some areas. Individual areas are irregular in shape and range from 20 to about 200 acres in size. They are about 40 percent Rhoades soil, 35 percent Daglum soil, and 5 to 20 percent Slickspots. The Rhoades soil and Slickspots generally are in the low spots, and the Daglum soil is on slight rises. The two soils and Slickspots are so intermingled that it is not practical to separate them in mapping.

Typically, the Rhoades soil has a surface layer of light brownish gray loam about 4 inches thick. The subsoil is about 15 inches thick. It is grayish brown, firm clay loam in the upper part and grayish brown, firm silty clay in the lower part. The underlying material to a depth of 43 inches is light yellowish brown, calcareous silty clay loam that has spots of gypsum and other salts. Light yellowish brown, calcareous siltstone is at a depth of 43 inches. In places the depth to siltstone is less than 40 inches.

Typically, the Daglum soil has a surface layer of grayish brown loam about 5 inches thick. The subsurface layer is gray silt loam about 2 inches thick. The subsoil is about 10 inches of grayish brown, very firm clay and silty clay. The underlying material to a depth of 60 inches is grayish brown, calcareous silty clay loam. It has spots of gypsum in the upper part. In places, the distinct gray subsurface layer does not occur and visible gypsum and other salts are at a greater depth than is typical for Daglum soils. In some areas the depth to siltstone is slightly less than 40 inches.

Slickspots have a light gray surface crust over massive clay or clay loam. They generally have visible salts at or near the surface.

Included in this unit in mapping are small areas of Morton, Reeder, and Regent soils, which make up 5 to 20 percent of the unit. These included soils have a smooth surface and generally are on the higher parts of the landscape. They contain less sodium than the Rhoades and Daglum soils.

The Rhoades and Daglum soils are moderate in content of organic matter but are low in fertility because of the sodium content. The Rhoades soil is especially difficult to work because of the claypan subsoil within a depth of 5 inches. Available water capacity is low in the Rhoades soil and moderate in the Daglum soil. The dense claypan subsoil in both soils releases moisture slowly to plants and limits the growth of roots. Permeability is very slow, and both soils shrink and swell upon drying and wetting. Runoff is slow to medium, and water generally ponds in the Slickspots.

Most areas remain in native grass and are used for range. This unit has poor to fair potential for range and most recreation uses and poor potential for crops, tame pasture and hayland, rangeland wildlife habitat, windbreaks and environmental plantings, and most engineering uses.

This unit is best suited to range. The natural plant cover is mainly mid and short grasses on the Rhoades and Daglum soils, but little or no vegetation grows on the Slickspots. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses and undesirable plants. Under these conditions, the amount of bare ground increases. Proper grazing use and deferred grazing help maintain or improve the range condition.

The Daglum soil can be used for small grain and tame pasture plants, but in most areas it is so intermingled with the Rhoades soil and Slickspots that farming is not feasible. A grass cover in cultivated or otherwise disturbed areas is best established by range seeding rather than by planting tame pasture plants.

Because the soils are so intermingled, this unit is not suited to windbreaks. The Daglum soil can support suited trees and shrubs that are planted for special purposes, but growth and survival are poor.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. This unit is well suited to sewage lagoons. Enlarging the absorption area in septic tank filter fields helps to overcome the slow absorption of liquid waste. Even after the absorption area is enlarged, however, the functioning of the disposal system is less than optimum.

Local roads and streets should be graded to shed water. Low strength limits the ability of the soils to support vehicular traffic, but strengthening or replacing the base material helps to overcome this limitation. Rhoades soil in capability unit VIs-1, Thin Claypan range site; Daglum soil in capability unit IVs-3, Claypan range site; Slickspots in capability unit VIIIs-3, not assigned to a range site.

RnD—Rhoades-Rock outcrop complex, 6 to 40 percent slopes. This map unit consists of deep, moderately well drained, moderately sloping and strongly sloping soils that have a claypan subsoil and moderately steep and steep areas of Rock outcrop. It is on escarpments and on the sides and around the heads of entrenched drainageways in the uplands. Slopes are broken and irregular. Individual areas range from 15 to about 100 acres in size. They are about 50 percent Rhoades soil and 35 percent Rock outcrop.

The Rhoades soil is on the lower parts of the landscape below the escarpments and on mesa flats above the Rock outcrop. Generally, it has slightly convex to slightly concave slopes that are less than 15 percent. The Rock outcrop is mainly on the escarpments and on the sides and around the head of the drainageways. The Rhoades soil and Rock outcrop are so intermingled that it is not practical to separate them in mapping.

Typically, the Rhoades soil has a surface layer of light brownish gray loam about 4 inches thick. The subsoil is about 15 inches thick. It is grayish brown, firm clay loam in the upper part and grayish brown, firm silty clay in the lower part. The underlying material to a depth of 43 inches is light yellowish brown, calcareous silty clay loam that has spots of gypsum and other salts. Light yellowish brown, calcareous siltstone is at a depth of 43 inches. In places the depth to siltstone is less than 40 inches.

The Rock outcrop part of this unit consists of eroding exposures of soft sandstone, siltstone, and shale. In places 2 to 5 inches of loose, weathered material is on the surface.

Included in this unit in mapping are small areas of Belfield, Cabba, Daglum, and Lantry soils and Slickspots. These included areas make up about 15 percent of the unit. Belfield and Daglum soils are on the lower part of the landscape near the Rhoades soil. They have a thicker surface layer and are deeper over a claypan subsoil than the Rhoades soil. The shallow Cabba soil and the moderately deep Lantry soil are on the higher parts of the landscape that have a grass cover. They contain less clay and less sodium than the Rhoades soil. Slickspots are intermingled with the Rhoades soil. They have visible salts at or near the surface.

The Rhoades soil is low in fertility and moderate in content of organic matter and is difficult to work. The sodium content adversely affects the availability of plant nutrients. The claypan subsoil releases moisture slowly to plants and limits the growth of roots. Permeability is very slow. The shrink-swell potential is high. Runoff is medium to rapid on the Rhoades soil and very rapid on the Rock outcrop.

The Rhoades soil is used for range, but the Rock outcrop is bare or nearly bare of vegetation and has little or no value for grazing by domestic livestock. This unit has poor potential for crops, tame pasture and hayland, range, rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation and engineering uses.

This unit is best suited to range. The natural plant cover on the Rhoades soil is mainly mid and short grasses. The scattered annuals and forbs that grow in places on the Rock outcrop provide a very limited amount of browse for wildlife. Management that maintains an adequate plant cover and ground mulch on the Rhoades soil helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses and undesirable plants. Under these conditions, a considerable amount of bare ground is evident and the risk of erosion increases. Proper grazing use and deferred grazing help maintain or improve the range condition in vegetated areas.

This unit is not suited to crops, tame pasture and hayland, and windbreaks. Trees and shrubs can be planted for special purposes on the Rhoades soil if they are given special care, but growth and survival are poor.

Buildings can be constructed on the Rhoades soil. Properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Sewage lagoons can be constructed in the less sloping areas of Rhoades soil. Septic tank absorption fields can be constructed on the Rhoades soil or on the included soils if the absorption area is enlarged to help overcome the slow absorption of liquid waste.

Local roads and streets can be built on the Rhoades soil. They should be graded to shed water. Low strength limits the ability of the Rhoades soil to support vehicular traffic, but strengthening or replacing the base material helps to overcome this limitation. Roadside erosion-control measures generally are needed in borrow and cut areas. Rhoades soil in capability unit VIs-1, Thin Claypan range site; Rock outcrop in capability unit VIIIs-1, not assigned to a range site.

RoE—Rock outcrop-Cabba complex, 9 to 40 percent slopes. This map unit consists of Rock outcrop and shallow, well drained, strongly sloping to steep soils on uplands, typically on escarpments and on the sides of ridges and deeply entrenched drainageways. Slopes are broken and irregular. Individual areas are irregular in shape and range from 10 to about 40 acres in size. They are about 55 percent Rock outcrop and 45 percent Cabba soil. The Cabba soil supports a grass cover. It has slopes that are dominantly less than 25 percent. Most of the Rock outcrop is steep. The Rock outcrop and the Cabba soil are so intermingled that it is not practical to separate them in mapping.

The Rock outcrop consists of eroding exposures of soft siltstone and sandstone and generally is steeper than the Cabba soil. In some areas 2 to 5 inches of loose, weathered material is on the surface. These areas support a few annuals and forbs.

The Cabba soil has a surface layer of grayish brown loam about 3 inches thick. The underlying material to a depth of 14 inches is light brownish gray, calcareous, friable silt loam. Light gray, calcareous, soft siltstone is at a depth of 14 inches. In places the soil contains more sand than is typical for Cabba soils. In some areas the depth to soft siltstone is more than 20 inches.

The Cabba soil is low in fertility and in content of organic matter. Available water capacity is very low. The growth of roots is limited by the shallowness to siltstone. Permeability is moderate. The shrink-swell potential also is moderate. Runoff is rapid on the Cabba soil and very rapid on the Rock outcrop.

The Cabba soil is used for range, but the Rock outcrop is bare or nearly bare of vegetation and has little or no value for grazing by domestic livestock. This unit has poor potential for crops, tame pasture and hayland, windbreaks and environmental plantings, and most recreation and engineering uses. The Cabba soil has fair potential for range and rangeland wildlife habitat.

This unit is best suited to range. The natural plant cover on the Cabba soil is mainly mid and short grasses. The scattered annuals and forbs that grow in places on the Rock outcrop provide a very limited amount of browse for wildlife, but generally the Rock outcrop is not suited to range. Management that maintains an adequate plant cover and ground mulch on the Cabba soil helps prevent excessive soil loss and the resulting increase in the extent of Rock outcrop. It also improves the moisture supply for range plants by reducing runoff. If range on the Cabba soil is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses and undesirable plants. Under these conditions, the plant cover becomes sparse and the risk of erosion increases. Proper grazing use and deferred grazing help maintain or improve the range condition on the Cabba soil.

This unit is not suited to crops, tame pasture and hayland, and windbreaks. Trees and shrubs can be planted for environmental purposes on the Cabba soil if additional water is provided and the trees are given special care. Survival and growth, however, generally are poor.

Buildings and waste disposal systems should be constructed on alternative sites. If buildings are constructed on the Cabba soil, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling and by the unstable underlying siltstone.

The route of local roads and streets should be carefully selected. Low strength limits the ability of the Cabba soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Roadside erosion-control measures are needed. Rock outcrop in capability unit VIIIs-1, not assigned to a range site; Cabba soil in capability unit VIe-11, Shallow range site.

SaA—Savage silty clay loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on uplands and terraces. Individual areas are irregular in shape and range from 15 to about 200 acres in size. Slopes are plane to slightly convex.

Typically, the surface layer is grayish brown silty clay loam about 5 inches thick. The subsoil is about 22 inches of firm clay. It is dark grayish brown in the upper part, grayish brown in the next part, and light yellowish brown in the lower part. The lower part is calcareous and has spots and streaks of lime that extend into the underlying material. To a depth of 55 inches, the underlying material is light brownish gray, calcareous clay. Below this to a depth of 60 inches, it is light brownish gray, mottled, calcareous clay loam. In places the depth to bedrock is slightly less than 40 inches, and in some areas the subsoil contains less clay than is typical for Savage soils.

Included with this soil in mapping are small areas of Arnegard, Belfield, Daglum, Grail, and Rhoades soils, which make up about 15 percent of the unit. Arnegard and Grail soils are in swales. They have dark colored layers more than 16 inches thick. Belfield, Daglum, and Rhoades soils are along drainageways. They contain more sodium than the Savage soil.

This Savage soil is medium in fertility and moderate in content of organic matter. Available water capacity is high. The surface layer is easy to till, but it tends to crust after hard rains. Permeability is moderately slow. The soil shrinks and swells upon drying and wetting. Runoff is slow.

Most areas are farmed. This soil has good potential for crops, tame pasture and hayland, range, openland and rangeland wildlife habitat, and windbreaks and environmental plantings; fair to good potential for recreation uses; and poor potential for most engineering uses.

This soil is suited to corn, small grain, alfalfa, and tame grasses. The periodic shortage of moisture common to the climate is the main concern if the soil is cropped. The hazard of soil blowing is slight to moderate. Stubble mulch, crop residue management, and minimum tillage help to conserve moisture. Wind stripcropping and field windbreaks help control soil blowing. Returning crop residue to the soil helps maintain fertility and tilth.

All climatically suited pasture plants grow well if this soil is seeded to tame pasture plants or hay. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

This soil is well suited to windbreaks and environmental plantings. A year of fallow prior to planting a windbreak helps in eliminating grass and weeds and in storing the moisture needed to establish the trees and shrubs.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. Enlarging the absorption area of septic tank filter fields helps to overcome the slow absorption of liquid waste. This soil is well suited to sewage lagoons.

Local roads and streets should be graded to shed water. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Capability unit IIc-2; Clayey range site.

SbA—Savage-Daglum complex, 0 to 2 percent slopes. This map unit consists of deep, well drained and moderately well drained, nearly level soils on uplands and terraces. Slopes are slightly convex to slightly concave. Individual areas are long and irregular in shape and range from 15 to about 200 acres in size. They are about 65 percent Savage soil and 30 percent Daglum soil. The well drained Savage soil is on very slight rises and has plane to slightly convex slopes. The moderately well drained Daglum soil is in shallow swales and has slightly concave slopes. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Savage soil has a surface layer of grayish brown silty clay loam about 5 inches thick. The subsoil is about 22 inches of firm clay. It is dark grayish brown in the upper part, grayish brown in the next part, and light yellowish brown in the lower part. The lower part is calcareous and has spots and streaks of lime that extend into the underlying material. To a depth of 55 inches, the underlying material is light brownish gray, calcareous clay. Below this to a depth of 60 inches, it is light brownish gray, mottled, calcareous clay loam.

Typically, the Daglum soil has a surface layer of grayish brown loam about 5 inches thick. The subsurface layer is gray silt loam about 2 inches thick. The subsoil is about 10 inches of grayish brown, very firm clay and silty clay. The underlying material to a depth of 60 inches is grayish brown, calcareous silty clay loam. It has spots of gypsum in the upper part. In places the distinct, gray subsurface layer does not occur and visible gypsum and other salts are at a greater depth than is typical for Daglum soils. In some areas the depth to soft bedrock is slightly less than 40 inches.

Included with these soils in mapping are small areas of Grail and Rhoades soils, which make up about 5 percent of the unit. The moderately well drained Grail soil is in some of the swales. It contains less sodium than the Daglum soil. Rhoades soils are intermingled with the Daglum soil. They have a surface layer that is less than 5 inches thick.

The Savage soil is medium in fertility and moderate in content of organic matter. The Daglum soil is low in fertility and moderate in content of organic matter. Available water capacity is high in the Savage soil and moderate in the Daglum soil. The sodium content of the Daglum soil adversely affects the availability of plant nutrients. Both soils tend to crust after hard rains, and the claypan subsoil of the Daglum soil releases moisture slowly to plants and limits the growth of roots. Permeability is moderately slow in the Savage soil and very slow in the Daglum soil. The shrink-swell potential is high. Runoff is slow.

Most areas are farmed. Some remain in native grass and are used for range and hay. These soils have fair to good potential for range and for tame pasture and hayland; fair potential for crops and most recreation uses; and poor potential for most engineering uses. The potential for openland and rangeland wildlife habitat and for windbreaks and environmental plantings is good on the Savage soil and poor on the Daglum soil.

These soils are better suited to small grain, alfalfa, and tame grasses than to corn. Crop growth is uneven, especially in dry years, because of the salts and sodium in the Daglum soil. Conserving moisture, controlling soil blowing, and improving tilth and water intake are the main concerns if the soils are cropped. Stubble mulch, crop residue management, and minimum tillage help conserve moisture. Wind stripcropping helps control soil blowing. Returning crop residue to the soils helps maintain or improve fertility and tilth. Chiseling or subsoiling temporarily improves water intake in the Daglum soil.

Seeding cultivated areas to suited tame pasture plants is an alternative use of these soils. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

These soils have few limitations for range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate plant cover and ground mulch improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

Windbreaks and environmental plantings can be established on the Savage soil. The choice of suited trees and shrubs is limited on the Daglum soil, and growth and survival are poor because of the sodium content and the dense claypan subsoil. A year of fallow prior to planting a windbreak helps in eliminating grass and weeds and in storing needed moisture.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. These soils are well suited to sewage lagoons. Enlarging the absorption area in septic tank filter fields helps to overcome the slow absorption of liquid waste.

Local roads and streets should be graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Savage soil in capability unit IIc-2, Clayey range site; Daglum soil in capability unit IVs-2, Claypan range site.

Sc—Shambo loam. This deep, well drained, nearly level soil is on terraces along the larger streams and their tributaries. Individual areas are long and narrow or irregularly shaped and range from 15 to about 200 acres in size. Slopes are plane to slightly convex and are mostly less than 3 percent.

Typically, the surface layer is loam about 8 inches thick. The upper part is grayish brown, and the lower part is brown. The subsoil is about 23 inches of friable loam. It is brown in the upper part and light brownish gray in the lower part. The lower part is calcareous and has spots and streaks of lime. To a depth of 42 inches, the underlying material is light yellowish brown, calcareous loam. Below this to a depth of 60 inches, it is grayish brown, calcareous gravelly sandy loam.

Included with this soil in mapping are small areas of Arnegard, Tally, and Trembles soils, which make up less than 10 percent of the unit. Arnegard soils are in swales. They have dark colored layers more than 16 inches thick. Tally soils are on some of the rises. They contain more sand than the Shambo soil. Trembles soils occur as narrow strips on bottom land below the Shambo soil. They are calcareous at or near the surface and contain more sand than the Shambo soil. Almost vertical escarpments are on the edges of some mapped areas.

This Shambo soil is medium in fertility and moderate in content of organic matter and can be easily tilled throughout a wide range in moisture content. Available water capacity is high, and permeability is moderate. The shrink-swell potential also is moderate. Runoff is slow.

Many areas are farmed. Some remain in native grass and are used for range and hay (fig. 10). This soil has good potential for crops, tame pasture and hayland, range, openland and rangeland wildlife habitat, windbreaks and environmental plantings, and recreation uses. It has fair potential for most engineering uses.

This soil is well suited to corn, small grain, alfalfa, and tame grasses. The periodic shortage of moisture common to the climate is the main concern if the soil is cropped. Also, the hazard of soil blowing is slight to moderate. Stubble mulch, crop residue management, and minimum tillage help conserve moisture. Wind stripcropping and field windbreaks help control soil blowing. Returning crop residue to the soil helps maintain fertility and tilth.

All climatically suited tame pasture plants grow well on this soil. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate grass cover and ground mulch improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

This soil is well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. A year of fallow prior to planting a windbreak helps in eliminating grass and weeds and in storing moisture.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent the structure damage caused by shrinking and swelling. This soil is well suited as a septic tank absorption field. Sealing the bottom and sides of sewage lagoons helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Keeping moisture away from the subgrade helps to prevent the road damage caused by frost action. This soil is suitable for irrigation. Capability unit IIc-2; Silty range site.

Sd—Shambo loam, channeled. This deep, well drained, nearly level to gently sloping soil is on low terraces, fans, and bottom land. In many areas it is subject to brief flooding during spring runoff or after hard rains. Individual areas generally are long and narrow and range from 15 to about 100 acres in size. Most of the areas are dissected by meandering stream channels that have vertical walls. The surface is uneven because of mounds and swales, both of which are old meander scars. Slopes generally are less than 6 percent but are as much as 9 percent on terrace fronts between the different levels of the landscape.

Typically, the surface layer is loam about 8 inches thick. The upper part is grayish brown, and the lower part is brown. The subsoil is about 23 inches of friable loam. It is brown in the upper part and light brownish gray in the lower part. The lower part is calcareous and has spots and streaks of lime. The underlying material to a depth of 60 inches is light brownish gray, calcareous loam that is stratified with layers of fine sandy loam and loamy fine sand. In some areas the subsoil contains more clay, and in places the soil is fine sandy loam throughout.

Included with this soil in mapping are small areas of Belfield, Manning, Rhoades, and Stady soils, which make up about 15 percent of the unit. These included soils generally are at the higher levels on the landscape. Belfield and Rhoades soils have a claypan subsoil and contain more sodium than the Shambo soil. Manning and Stady soils have sand and gravel within a depth of 40 inches.

This Shambo soil is medium in fertility and moderate in content of organic matter and can be easily tilled throughout a wide range in moisture content. Permeability is moderate in the upper part and moderately rapid in the underlying material. The shrink-swell potential is low. Runoff is slow.

Most areas remain in native vegetation and are used for range and hay. A few areas are farmed. This soil has good potential for range, rangeland wildlife habitat (fig. 11), and some recreation uses; fair potential for tame pasture and hayland; and poor potential for crops, windbreaks and environmental plantings, and engineering uses.

This soil is best suited to range. The natural plant cover is mainly a mixture of tall, mid, and short grasses, but scattered native trees and shrubs are along the stream channels in some areas. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

Annual crops can be grown on this soil, but the channels dissect the narrow areas into such small parcels that farming is not practical. The soil is suitable for gardening in small tracts. Seeding cultivated and otherwise disturbed areas to tame pasture plants minimizes flood damage. Windbreaks are not feasible in the small, narrow areas between channels, but the soil can be used for trees and shrubs that are planted for environmental purposes.

This soil is not suited to camp areas and playgrounds because of the flood hazard. It can be used, however, for picnic areas and paths and trails.

Buildings and waste disposal systems should not be constructed on this soil unless adequate protection against flooding is provided. Sealing the bottom and sides of sewage lagoons helps to prevent excessive seepage.

Local roads and streets should be graded above expected flood levels. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Capability unit VIw-1; Overflow range site.

SeA—Stady loam, 0 to 2 percent slopes. This well drained, nearly level soil is on terraces. It is underlain by sand and gravel at a moderate depth. Individual areas are long and narrow or irregularly shaped and range from 15 to about 100 acres in size. Slopes are plane to slightly convex.

Typically, the surface layer is dark grayish brown loam about 6 inches thick. The subsoil is about 18 inches thick. It is brown, friable loam in the upper part; yellowish brown clay loam in the next part; and light yellowish brown, calcareous clay loam in the lower part. The lower part has spots and streaks of lime. The underlying material to a depth of 60 inches is light yellowish brown, calcareous sand and gravel. In places the surface layer and subsoil are fine sandy loam.

Included with this soil in mapping are small areas of Belfield, Farnuf, and Wabek soils, which make up about 10 percent of the unit. Belfield soils are in swales or along drainageways. They contain more clay and sodium in the subsoil than the Stady soil and are more than 40 inches deep to sand and gravel. Farnuf soils are intermingled with the Stady soil. They are more than 40 inches deep to sand and gravel. The excessively drained Wabek soils are on slight rises or on the edges of the terraces. They have sand and gravel within a depth of 14 inches.

This Stady soil is medium in fertility and moderate in content of organic matter and can be easily tilled throughout a wide range in moisture content. Available water capacity is low, and the soil is droughty. Permeability is moderate through the subsoil and rapid in the underlying sand and gravel. Runoff is slow.

Most areas are farmed. Some remain in native grass and are used for range. This soil has good potential for range, rangeland wildlife habitat, and most recreation and engineering uses. It has fair potential for crops, tame pasture and hayland, and openland wildlife habitat and poor potential for windbreaks and environmental plantings.

This soil is better suited to small grain and tame grasses than to deep-rooted crops, such as corn and alfalfa, because it is droughty. Conserving moisture and controlling soil blowing are the main concerns if the soil is cropped. Stubble mulch, crop residue management, and minimum tillage help conserve moisture. Wind stripcropping helps control soil blowing. Returning crop residue to the soil helps maintain fertility and tilth.

Seeding cultivated areas to tame pasture plants is an effective means of controlling soil blowing, but the choice of tame pasture plants is limited by the droughtiness. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate grass cover and ground mulch improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

This soil is poorly suited to windbreaks and environmental plantings because it is droughty. It can be used for windbreaks unless optimum survival, growth, and vigor are required or expected. Providing additional water increases the chance for survival of the trees and shrubs planted for environmental purposes.

This soil has only slight limitations as a site for buildings and septic tank absorption fields. The effluent, however, can pollute shallow ground water. Sealing the bottom and sides of sewage lagoons helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Keeping moisture away from the subgrade helps to prevent the road damage caused by frost action.

This soil has fair potential for irrigation, but the low available water capacity and the rapid permeability of the underlying sand and gravel should be considered in designing the irrigation system. The soil is a potential source of sand and gravel for use in construction unless the amount of fines in the sand and gravel is excessive. Capability unit IIIs-2; Silty range site.

Sh—Lohler-Trembles complex. This map unit consists of deep, moderately well drained and well drained, nearly level soils on bottom land. These soils are subject to stream flooding. Slopes are dominantly 0 to 2 percent but are steeper on rises between different levels on the flood plain. In places the surface is uneven because of old meander scars or flood routes. Individual areas are round or irregularly shaped and range from 10 to about 50 acres in size. They are about 50 to 70 percent Lohler soil and 20 to 40 percent Trembles soil. The moderately well drained Lohler soil is on the lower parts of the landscape. The well drained Trembles soil is at slightly higher levels and on low terrace fronts. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Lohler soil has a surface layer of gray clay about 6 inches thick. To a depth of 28 inches, the underlying material is grayish brown, firm clay loam stratified with thin lenses of very fine sandy loam, loam, and silt loam. Below this to a depth of 60 inches, it is grayish brown clay stratified with layers of very fine sandy loam.

Typically, the Trembles soil has a surface layer of grayish brown fine sandy loam about 6 inches thick. The underlying material to a depth of 60 inches is light brownish gray, calcareous, very friable fine sandy loam. The upper part is stratified with lenses of loamy fine sand and very fine sandy loam. In places the soil is a loam that contains more silt and clay than is typical for Trembles soils.

Included with this unit in mapping are small areas of Banks and Shambo soils, which make up about 10 percent of the unit. Banks soils are intermingled with the Trembles soil. They are more sandy than that soil. Shambo soils are on terrace levels above the Trembles soil. They have a texture of loam and are deeper to lime than the Trembles soil.

The Lohler soil is medium in fertility and moderately low in content of organic matter. The Trembles soil is low in fertility and in content of organic matter. Available water capacity is moderate in both soils. Permeability is slow in the Lohler soil and moderately rapid in the Trembles soil. The Lohler soil shrinks and swells upon drying and wetting. Runoff is slow on both soils.

Many areas remain in native grass and are used for range and hay. Some areas are cropped. These soils have good potential for crops, tame pasture and hayland, range, openland wildlife habitat, and windbreaks and environmental plantings; fair potential for rangeland wildlife habitat; fair to poor potential for most recreation uses; and poor potential for most engineering uses.

These soils are suited to corn, small grain, alfalfa, and tame grasses. They are subject to stream flooding, but in most years the flood damage is minor. Wetness on the Lohler soil, which dries slowly, delays spring planting in some years. The main concerns in managing these soils for crops are the periodic shortage of moisture common to the climate and soil blowing on the Trembles soil. Stubble mulch, crop residue management, minimum tillage, and wind stripcropping help conserve moisture and control soil blowing. Returning crop residue to the soils helps maintain fertility and tilth.

All climatically suited tame pasture plants grow well on these soils. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

These soils are well suited to range. The natural plant cover is mainly a mixture of tall, mid, and short grasses. Clumps of native trees and shrubs along the stream channels in some areas provide winter protection for livestock and wildlife. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive mid and short grasses and undesirable plants. Proper grazing use and deferred grazing help maintain or improve the range condition.

These soils are well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Adequate site preparation and weed control after the planting is established help conserve moisture. Keeping a cover of crop residue on the surface of the Trembles soil during site preparation helps control soil blowing.

Buildings should be constructed only in the areas of Trembles soil that are adequately protected against flooding. Septic tank absorption fields can be constructed in the higher lying areas of the Trembles soil and the included Shambo soils. Sewage lagoons work best in the areas of Lohler soil that are protected against flooding.

Roads and streets should be graded above expected flood levels. Low strength limits the ability of the Lohler soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Overflow range site; Lohler soil in capability unit IIc-1, Trembles soil in capability unit IIIe-7.

Ta—Trembles fine sandy loam. This deep, well drained, nearly level to gently sloping soil is on bottom land and low terraces. In most areas it is subject to stream flooding. Individual areas generally are long and narrow and range from 15 to about 100 acres in size. Slopes are mostly less than 3 percent but are as much as 6 percent in some areas.

Typically, the surface layer is grayish brown fine sandy loam about 6 inches thick. The underlying material to a depth of 60 inches is light brownish gray, calcareous fine sandy loam. It is stratified with thin layers of loamy fine sand and very fine sandy loam in the upper part. In places the soil is a loam that contains more silt and clay than is typical for Trembles soils. In some areas near the stream channel, it is more sandy than is typical for Trembles soils.

This soil is low in fertility and in content of organic matter, but it can be easily tilled throughout a wide range in moisture content. Available water capacity is moderate, and permeability is moderately rapid. Runoff is slow.

About half of the acreage is cropped. The other half remains in native vegetation and is used for range and hay. This soil has good potential for range, windbreaks and environmental plantings, and openland wildlife habitat; fair to good potential for recreation uses; fair potential for crops, tame pasture and hayland, and rangeland wildlife habitat; and poor potential for most engineering uses.

This soil is suited to corn, small grain, alfalfa, and tame grasses. The damage from stream flooding generally is minor, but soil blowing is a severe hazard if the soil is cropped. Stubble mulch, crop residue management, minimum tillage, wind stripcropping, and field windbreaks help control soil blowing and conserve moisture. Returning crop residue to the soil, planting green manure crops, and applying animal manure improve fertility and tilth.

Seeding cultivated areas to suited tame pasture plants is an effective means of controlling soil blowing. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly a mixture of tall, mid, and short grasses. Scattered native trees and shrubs are along the stream channel in some areas. Management that maintains an adequate grass cover and ground mulch helps control soil blowing and improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

This soil is well suited to windbreaks and environmental plantings. Keeping a cover of crop residue on the surface during site preparation helps control soil blowing.

This soil is well suited as a site for picnic areas and paths and trails but should not be used for camp areas and playgrounds unless it is adequately protected from floodwater. Buildings and waste disposal systems should not be constructed unless the soil is adequately protected against flooding. The effluent from septic tank absorption fields can pollute shallow ground water. Sealing the bottom and sides of sewage lagoons helps to prevent excessive seepage.

Local roads and streets should be graded above expected flood levels. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Keeping moisture away from the subgrade helps to prevent the road damage caused by frost action. If adequately protected against soil blowing and flooding, this soil has good potential for irrigation. Capability unit IIIe-7; Overflow range site.

Tb—Trembles soils, channeled. This map unit consists of deep, well drained, nearly level to gently sloping soils on bottom land. In most areas it is subject to stream flooding. Individual areas are long and narrow and range from 30 to about 150 acres in size. The narrow areas are dissected by meandering channels that have vertical walls and are 3 to 20 feet wide and 2 to 8 feet deep. Slopes are mostly less than 3 percent but are as much as 6 percent in some areas. The surface is uneven because of old meander scars.

Typically, the surface layer is grayish brown fine sandy loam about 6 inches thick, but in some areas it is dominantly loamy fine sand and in some it is dominantly loam or very fine sandy loam. In the rest of the areas, the proportion of these textures varies. The underlying material to a depth of 60 inches is light brownish gray, calcareous fine sandy loam. It is stratified in the upper part with thin layers of loamy fine sand and very fine sandy loam. In places, the underlying material is loam or silt loam and the soil contains more clay than is typical for Trembles soils. In some areas the underlying material is more sandy than is typical for Trembles soils.

Included with these soils in mapping are small areas of Fluvaquents and Lohler soils, which make up about 10 percent of the unit. The poorly drained Fluvaquents are in low wet spots. They have salts at or near the surface. The moderately well drained clayey Lohler soils are in swales or old meander scars.

The Trembles soils are low in fertility and in content of organic matter. Available water capacity is moderate, and permeability is moderately rapid. Runoff is slow.

Most areas remain in native vegetation and are used for range and hay. These soils have good potential for range, fair to good potential for recreation uses, fair potential for tame pasture and hayland and for rangeland wildlife habitat, and poor potential for crops, windbreaks and environmental plantings, and most engineering uses.

These soils are best suited to range. The native plant cover is mainly a mixture of tall, mid, and short grasses. The scattered native trees and shrubs along the channels in some areas provide protection and browse for rangeland wildlife. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

These soils are suitable as sites for small gardens, but the channels dissect the narrow areas into such small parcels that growing annual crops is not practical. Seeding disturbed areas to tame pasture plants minimizes flood damage. These soils are so channeled that windbreaks are not feasible, but they can be used as sites for trees and shrubs planted for environmental purposes.

As a result of the flood hazard, these soils are not suited as sites for camp areas and playgrounds. They can be used, however, as sites for picnic areas and paths and trails.

Generally, these soils should not be used as sites for buildings and waste disposal systems because of the flood hazard. Local roads and streets should be graded above expected flood levels. Low strength limits the ability of the soils to support vehicular traffic, but this limitation can be overcome by strengthening the base material. Keeping moisture away from the subgrade helps to prevent the road damage caused by frost action. Capability unit VIw-1; Overflow range site.

TcD—Twilight-Marmarth-Parchin association, gently rolling. This map unit consists of moderately deep, well drained, gently sloping to rolling soils on uplands. Slopes typically are 6 to 9 percent but range from 2 to 15 percent. Individual areas range from 40 to 400 acres in size. They are about 45 percent Twilight soil, 25 percent Marmarth soil, and 20 percent Parchin soil.

The Twilight soil generally is on the higher parts of the landscape and has convex slopes that are mostly 6 to 15 percent. The Marmarth soil generally is below the Twilight soil on the landscape and has smooth slopes that range from 2 to 9 percent. The Parchin soil is in swales and sags and on foot slopes and has concave slopes that are mostly 2 to 6 percent. In many areas these soils could be mapped separately, but they are not mapped separately because the current land use and the potential for other uses are similar.

Typically, the Twilight soil has a surface layer of grayish brown fine sandy loam about 3 inches thick. The subsoil is about 15 inches of very friable fine sandy loam. It is brown in the upper part and grayish brown in the lower part. The underlying material to a depth of 34 inches is light gray, calcareous fine sandy loam. Light gray, calcareous, soft sandstone is at a depth of 34 inches.

Typically, the Marmarth soil has a surface layer of dark grayish brown loam about 7 inches thick. The subsoil is about 8 inches of grayish brown, friable heavy loam. The underlying material to a depth of 25 inches is light gray, calcareous loam. Light gray and yellow, calcareous, soft sandstone is at a depth of 25 inches. On the lower parts of the landscape, the depth to soft sandstone is more than 40 inches. In places the surface layer and subsoil are silty clay loam.

Typically, the Parchin soil has a surface layer that is about 6 inches thick. The surface layer is grayish brown fine sandy loam in the upper part and brown loamy fine sand in the lower part. The subsurface layer is pale brown, very friable loamy fine sand about 4 inches thick. The subsoil is about 17 inches thick. It is grayish brown, firm sandy clay loam in the upper part and light olive gray, calcareous fine sandy loam in the lower part. The lower part has spots and streaks of lime. Light gray and light olive gray, calcareous, soft sandstone is at a depth of 27 inches. In places, the surface layer is silt loam, the subsoil is silty clay, and the depth to bedrock is more than 40 inches.

Included with these soils in mapping are small areas of Absher, Blackhall, Cabbart, and Wayden soils and Slickspots. These included areas make up about 10 percent of the unit. The shallow Blackhall, Cabbart, and Wayden soils are on some of the ridgetops and around the head and on the shoulders of drainageways. Absher soils and Slickspots are in some of the swales. Absher soils have a surface layer that is less than 4 inches thick over a claypan subsoil. Slickspots have a gray crust over massive clay or clay loam. They have salts at or near the surface.

The Twilight, Marmarth, and Parchin soils are low to medium in fertility and low to moderate in content of organic matter. Available water capacity is low. The growth of roots is limited by the moderate depth to sandstone in all three soils and by the sodium-affected claypan subsoil in the Parchin soil. This claypan subsoil takes in water slowly and releases moisture slowly to plants. Permeability is moderately rapid in the Twilight soil, moderate in the Marmarth soil, and slow or very slow in the Parchin soil. The shrink-swell potential is moderate in the Marmarth and Parchin soils. Runoff is medium.

Most areas are in native grass and are used for range. These soils have fair potential for range, tame pasture and hayland, and most recreation uses and poor to fair potential for crops and for most engineering uses. The Twilight and Parchin soils have poor potential for windbreaks and environmental plantings and fair to poor potential for rangeland wildlife habitat. The Marmarth soil has good potential for windbreaks and environmental plantings and for rangeland wildlife habitat.

These soils are best suited to range. The natural plant cover is a mixture of tall, mid, and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

In many areas the Twilight soil is not suited to crops because of the slope and very severe hazards of erosion and soil blowing. The Marmarth and Parchin soils are suited to small grain and tame grasses, but crops grow poorly during dry periods, especially on the Parchin soil. Controlling erosion and soil blowing, conserving moisture, maintaining fertility and tilth, and improving water intake in the Parchin soil are the major concerns if the soils are cropped. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and conserve moisture. Wind stripcropping helps control soil blowing. Returning crop residue to the soils helps maintain fertility and tilth.

Seeding cultivated areas to suited tame pasture plants helps control erosion and soil blowing. Because of the erosion hazard, bunch grasses should not be planted alone in areas where slopes are more than 6 percent. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

Windbreaks should be planted on the Marmarth soil. The Twilight soil generally is not suited to windbreaks, and the choice of trees and shrubs is limited and growth is less than optimum on the Parchin soil. Keeping a cover of crop residue on the surface during site preparation helps control erosion and soil blowing. Planting the trees and shrubs on the contour helps conserve moisture.

If buildings are constructed on the Marmarth and Parchin soils, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling. The bedrock underlying these soils generally is rippable. Disturbed areas around newly constructed buildings should be revegetated as soon as possible to control erosion and soil blowing. The lower parts of the landscape where the soils are deepest and the slopes are more gentle are the best sites for waste disposal systems. Enlarging the absorption area of septic tank filter fields on the Marmarth and Parchin soils helps to overcome the slow absorption of liquid waste and the moderate depth to bedrock.

Local roads and streets should be graded to shed water. Low strength limits the ability of these soils to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Roadside erosion-control measures help to control erosion and soil blowing in borrow and cut areas on the higher parts of the landscape. Twilight soil in capability unit VIe-7, Sandy range site; Marmarth soil in capability unit IVe-1, Silty range site; Parchin soil in capability unit IVe-12, Claypan range site.

VaC—Vebar-Cohagen complex, 2 to 9 percent slopes. This map unit consists of moderately deep and shallow, well drained, gently sloping to gently rolling soils on uplands. Individual areas are irregular in shape and range from 30 to about 900 acres in size. They are about 65 percent Vebar soil and 30 percent Cohagen soil. The Vebar soil is on the mid and lower parts of the landscape and generally has slopes of less than 6 percent. The Cohagen soil generally is on the tops and upper sides of ridges and knolls. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Vebar soil has a surface layer of dark brown fine sandy loam about 4 inches thick. The subsoil is about 24 inches of very friable and friable fine sandy loam. It is brown in the upper part and light yellowish brown in the lower part. Light gray, calcareous, soft sandstone is at a depth of 28 inches. On the lower part of the landscape, the depth to sandstone is more than 40 inches. In places, the surface layer and subsoil are loam and the soil contains more clay than is typical for Vebar soils.

Typically, the Cohagen soil has a surface layer of brown, calcareous loamy very fine sand about 3 inches thick. The underlying material to a depth of 16 inches is pale brown, calcareous, very friable loamy very fine sand. Pale brown and pale yellow, calcareous, soft sandstone is at a depth of 16 inches.

Included with these soils in mapping are small areas of Parshall soils in some of the swales. These deep Parshall soils have dark colored layers more than 16 inches thick and contain more organic matter than the Vebar soil.

The Vebar soil is medium in fertility and moderately low in content of organic matter. The Cohagen soil is low in fertility and in content of organic matter. Available water capacity is low in the Vebar soil and very low in the Cohagen soil. The growth of roots is limited by the underlying sandstone in both soils. Permeability is moderately rapid, and runoff is slow to medium.

Less than half of the acreage is farmed. These soils have good to fair potential for range, rangeland wildlife habitat, and most recreation uses; fair potential for crops and tame pasture and hayland; and fair to poor potential for most engineering uses. The potential for windbreaks and environmental plantings is good on the Vebar soil and poor on the Cohagen soil.

These soils are suited to small grain, alfalfa, and tame grasses. Corn can be grown if the cultivated field is almost entirely Vebar soil. Spring-sown small grain is better suited than winter wheat because the hazard of soil blowing is severe. Controlling soil blowing and erosion, conserving moisture, and maintaining fertility and tilth are the main concerns if the soils are cropped. Stubble mulch, crop residue management, minimum tillage, close-sown crops, and wind stripcropping help control soil blowing and erosion and conserve moisture. Returning crop residue to the soils and applying animal manure help maintain fertility and tilth.

Seeding cultivated areas to suited tame pasture plants is an effective means of controlling soil blowing and erosion. Bunch grasses should not be planted alone in areas where slopes are more than 6 percent. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

These soils are well suited to range. The natural plant cover is a mixture of tall, mid, and short grasses. Management that maintains an adequate grass cover and ground mulch prevents excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

Windbreaks and environmental plantings can be established on the Vebar soil. The Cohagen soil is not suited to windbreaks. Keeping a good cover of crop residue on the surface during site preparation helps control soil blowing. Planting the trees and shrubs on the contour helps conserve moisture.

Generally, the underlying soft sandstone is rippable and is not a serious problem if buildings are constructed on these soils. The lower parts of the landscape where the soils are deeper and less sloping are the best sites for waste disposal systems. Sealing the bottom and sides of sewage lagoons helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Roadside erosion-control measures help reduce the risks of soil blowing and erosion in borrow and cut areas. Vebar soil in capability unit IIIe-10, Sandy range site; Cohagen soil in capability unit VIe-10, Shallow range site.

VaD—Vebar-Cohagen complex, 6 to 25 percent slopes. This map unit consists of moderately deep and shallow, well drained, moderately sloping to moderately steep soils on uplands. Individual areas are irregular in shape and range from 30 to about 900 acres in size. They are about 55 percent Vebar soil and 35 percent Cohagen soil. The Vebar soil is on the mid and lower parts of the landscape and generally has slopes of less than 15 percent. The Cohagen soil is on the tops and upper sides of ridges and hills. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Vebar soil has a surface layer of dark brown fine sandy loam about 4 inches thick. The subsoil is about 24 inches of very friable and friable fine sandy loam. It is brown in the upper part and light yellowish brown in the lower part. Light gray, calcareous, soft sandstone is at a depth of 28 inches. In some places on the lower part of the landscape, the depth to sandstone is more than 40 inches.

Typically, the Cohagen soil has a surface layer of brown, calcareous loamy very fine sand about 3 inches thick. The underlying material to a depth of 16 inches is pale brown, calcareous, very friable loamy very fine sand. Pale brown and pale yellow, calcareous, soft sandstone is at a depth of 16 inches. In places, the upper part of the sandstone is a strongly cemented cap rock about 12 inches thick, but this is underlain by soft sandstone. In places the soil is a loam or silt loam that contains less sand than is typical for Cohagen soils.

Included with these soils in mapping are small areas of Parshall and Wabek soils and Rock outcrop. These included areas make up about 10 percent of the unit. Parshall soils are on foot slopes and in swales. They have dark colored layers more than 16 inches thick and contain more organic matter than the Vebar soil. Wabek soils are on gravelly ridges and have sand and gravel within a depth of 14 inches. Rock outcrop consists of almost vertical exposures of sandstone near the crest of some ridges.

The Vebar soil is medium in fertility and moderately low in content of organic matter. The Cohagen soil is low in fertility and in content of organic matter. Available water capacity is low in the Vebar soil and very low in the Cohagen soil. The growth of roots is limited by the underlying sandstone in both soils. Permeability is moderately rapid, and runoff is medium.

Almost all areas are in native grass and are used for range. These soils have good to fair potential for range and rangeland wildlife habitat, fair to poor potential for tame pasture and hayland and for most recreation and engineering uses, and poor potential for crops and for windbreaks and environmental plantings.

These soils are best suited to range. The natural plant cover is a mixture of tall, mid, and short grasses. Management that maintains an adequate grass cover and ground mulch prevents excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

The Cohagen soil is not suited to farming. The Vebar soil can be used for small grain and tame grasses if the slope is less than 9 percent. In most areas where the slope is less than 9 percent, however, the Vebar soil is intermingled with steeper and shallower soils that are not suitable for cultivation. Stubble mulch, crop residue management, contour farming, terraces, and grassed waterways help control erosion and soil blowing in areas where the Vebar soil is farmed.

Seeding suited tame pasture plants is an effective means of controlling erosion and soil blowing in cultivated areas of the Vebar soil. Bunch grasses should not be planted alone because of the erosion hazard. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established. If the Cohagen soil makes up a substantial part of a cultivated or disturbed area, range seeding is the preferred method of establishing a grass cover.

Windbreaks can be planted on the Vebar soil if the slope is less than 9 percent, but in most areas the soil is too steep and is so intermingled with the shallow Cohagen soil that windbreaks are not feasible. Trees and shrubs can be planted for environmental purposes on the Vebar soil.

Buildings can be constructed on the Vebar soil. Generally, the underlying sandstone is rippable and is not a serious problem. The lower parts of the landscape where the soils are deeper and less sloping are the best sites for waste disposal systems.

Local roads and streets should be graded to shed water. Roadside erosion-control measures help control erosion and soil blowing in borrow and cut areas. Capability unit VIe-6; Vebar soil in Sandy range site, Cohagen soil in Shallow range site.

VbB—Vebar-Tally fine sandy loams, 0 to 6 percent slopes. This map unit consists of moderately deep and deep, well drained, nearly level and gently sloping soils on uplands. Slopes are dominantly 2 to 6 percent but are less than 2 percent in some small areas. Individual areas are irregular in shape and range from 15 to about 200 acres in size. They are about 65 percent Vebar soil and 25 percent Tally soil. The Vebar soil generally is on the mid and higher parts of the landscape. The Tally soil is on foot slopes and in swales. The two soils are so intermingled that it is not practical to separate them in mapping.

Typically, the Vebar soil has a surface layer of dark brown fine sandy loam about 4 inches thick. The subsoil is about 24 inches of very friable and friable fine sandy loam. It is brown in the upper part and light yellowish brown in the lower part. Light gray, calcareous, soft sandstone is at a depth of 28 inches. In places the subsoil is sandy clay loam and contains more clay than is typical for Vebar soils.

Typically, the Tally soil has a surface layer of dark grayish brown fine sandy loam about 7 inches thick. The subsoil is about 12 inches of brown, very friable fine sandy loam and sandy loam. To a depth of 36 inches, the underlying material is very pale brown, calcareous fine sandy loam. Below this to a depth of 60 inches, it is light gray loamy fine sand. In places the subsoil is sandy clay loam and contains more clay than is typical for Tally soils. In some swales the soil has dark colored layers more than 16 inches thick and contains more organic matter than Tally soils.

Included with these soils in mapping are small areas of Cohagen and Reeder soils, which make up about 10 percent of the unit. The shallow Cohagen soils are on the tops and upper sides of some of the ridges. Reeder soils are intermingled with the Vebar soil. They have a clay loam subsoil and contain less sand than the Vebar soil.

The Vebar and Tally soils are medium in fertility and moderately low in content of organic matter and can be easily tilled throughout a wide range in moisture content. Available water capacity is low in the Vebar soil and low or moderate in the Tally soil. The growth of roots is limited by the underlying sandstone in the Vebar soil. Permeability is dominantly moderately rapid but commonly is rapid in the lower part of the Tally soil. Runoff is slow.

Many areas are farmed. These soils have good potential for range, rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses and fair potential for crops, tame pasture and hayland, openland wildlife habitat, and most engineering uses.

These soils are suited to corn, small grain, alfalfa, and tame grasses. Spring-sown small grain is better suited than winter wheat because the hazard of soil blowing is severe. Controlling soil blowing and erosion, conserving moisture, and maintaining fertility and tilth are the major concerns if the soils are cropped. Stubble mulch, crop residue management, wind stripcropping, and field windbreaks help control soil blowing and erosion and conserve moisture. Grassed waterways help control erosion. Returning crop residue to the soils helps maintain fertility and tilth.

Seeding cultivated areas to suited tame pasture plants is an effective means of controlling soil blowing and erosion. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

These soils are well suited to range. The natural plant cover is a mixture of tall, mid, and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

These soils are well suited to windbreaks and environmental plantings. Keeping a cover of crop residue on the surface helps control soil blowing during site preparation.

Generally, the soft sandstone underlying the Vebar soil is rippable and is not a serious problem if buildings are constructed on this unit. The lower parts of the landscape where the soils are deeper and less sloping are the best sites for waste disposal systems. The effluent from septic tank absorption fields can pollute shallow ground water. Sealing the bottom and sides of sewage lagoons helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Keeping moisture away from the subgrade helps to prevent the road damage caused by frost action. Capability unit IIIe-10; Sandy range site.

WaD—Wabek sandy loam, 9 to 35 percent slopes. This excessively drained, rolling to steep soil is on gravelly upland ridges and terrace fronts. Individual areas are long and narrow and range from 10 to about 50 acres in size. Slopes generally are short and convex.

Typically, the surface layer is dark grayish brown, calcareous sandy loam about 5 inches thick. To a depth of 12 inches, the underlying material is grayish brown, calcareous, loose gravelly sandy loam. Below this to a depth of 60 inches, it is varicolored, calcareous sand and gravel.

Included with this soil in mapping are small areas of Cabba, Manning, and Stady soils, which make up about 15 percent of the unit. The shallow Cabba soil is on ridges. It is underlain by soft siltstone rather than sand and gravel. Manning and Stady soils are on the wider ridgetops or on the lower part of the landscape below the Wabek soil. They are deeper to sand and gravel than the Wabek soil. Almost vertical escarpments are on the edges of some mapped areas.

This Wabek soil is low in fertility and in content of organic matter. Available water capacity is very low. The growth of roots is limited by the very low available water capacity in the underlying sand and gravel. Permeability is moderately rapid in the upper 12 inches and very rapid below. Runoff is slow.

All areas are in native grass and are used for range. This soil has poor potential for crops, tame pasture and hayland, range, rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation and engineering uses.

This soil is best suited to range. The natural plant cover is mainly mid and short grasses and dryland sedges. Management that maintains an adequate grass cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses, sedges, and undesirable plants. Under these conditions, a considerable amount of bare ground is evident and the risks of erosion and soil blowing increase. Proper grazing use and deferred grazing help maintain or improve the range condition.

This soil is not suited to crops, tame pasture and hayland, and windbreaks because of steep slopes, low fertility, and droughtiness. Trees and shrubs can be established for environmental or other special purposes if they are planted by hand and given special care, including additions of water.

Buildings, local roads and streets, and septic tank absorption fields can be constructed in areas where the soil is less steep. The effluent from septic tank absorption fields can pollute shallow ground water. The soil is a potential source of gravel for use in construction. Capability unit VIIs-4; Very Shallow range site.

WbA—Wabek very gravelly loamy sand, 0 to 2 percent slopes. This excessively drained, nearly level soil occurs mainly as a borrow area near Shadehill Dam. Slopes are mostly less than 2 percent but are steeper in some included areas. Individual areas are mostly long and narrow and are about 100 acres or more in size.

Typically, the surface layer is grayish brown, calcareous very gravelly loamy sand about 5 inches thick. The underlying material to a depth of 60 inches is calcareous sand and gravel.

Included with this soil in mapping are small areas of Manning and Stady soils, which make up about 10 percent of the unit. These soils are in undisturbed areas. They are more than 20 inches deep to sand and gravel.

This Wabek soil is low in fertility and in content of organic matter. Available water capacity is very low. The growth of roots is limited by the very low available water capacity of the underlying sand and gravel. Permeability is very rapid, and runoff is slow.

This soil is used mainly for wildlife habitat. It has good potential for most recreation and engineering uses and poor potential for crops, tame pasture and hayland, range, rangeland wildlife habitat, and windbreaks and environmental plantings.

Parts of the two major areas of this soil have been seeded to crested wheatgrass and smooth bromegrass. In other places the plant cover consists of native grasses, forbs, and annual weeds. Scattered clumps of cottonwood trees that volunteered during a high water period in the reservoir provide cover and browse for wildlife.

This soil is not suited to crops and windbreaks because of low fertility and droughtiness. Suited trees and shrubs, however, can be planted for environmental purposes and for wildlife habitat if additional water is provided and the trees and shrubs are given special care.

This soil has few limitations as a site for buildings, local roads and streets, and septic tank absorption fields. The effluent from septic tank absorption fields, however, can pollute shallow ground water. The soil is a potential source of gravel for use in construction. Capability unit VIs-4; Very Shallow range site.

WcA—Watrous loam, shallow, 0 to 3 percent slopes. This shallow, well drained, nearly level and gently sloping soil is on uplands on the mesalike tops of ridges and buttes. Individual areas are irregular in shape and range from 15 to about 200 acres in size. Slopes are plane to slightly convex.

Typically, the surface layer is dark grayish brown loam about 5 inches thick. The subsoil is about 9 inches of friable loam. It is dark grayish brown in the upper part and brown in the lower part. White, fractured hard sandstone is between depths of 14 and 25 inches (fig. 12). Below this to a depth of 60 inches is pale yellow, soft sandstone. The sandstone in both layers is calcareous.

Included with this soil in mapping are small areas of Belfield, Reeder, and Vebar soils, which make up about 15 percent of the unit. The deep Belfield soils are in slightly concave low areas. They contain more sodium than the Watrous soil. Scattered areas of the moderately deep Reeder and Vebar soils are throughout the unit.

This Watrous soil is medium in fertility and moderate in content of organic matter. It is droughty. Available water capacity is very low. The growth of roots is restricted by the shallowness to sandstone. Permeability is moderate in the surface layer and subsoil. The shrink-swell potential is moderate. Runoff is slow to medium.

Many areas are farmed. Some remain in native grass and are used for range. This soil has good potential for tame pasture and hayland, range, rangeland wildlife habitat, and most recreation uses; fair potential for crops and openland wildlife habitat; and poor potential for windbreaks and environmental plantings and for most engineering uses.

This soil is better suited to small grain and tame grasses than to deep-rooted crops, such as corn and alfalfa. Conserving moisture and controlling soil blowing are the main concerns if the soil is cropped. Stubble mulch, crop residue management, minimum tillage, and wind stripcropping help conserve moisture and control soil blowing. Returning crop residue to the soil helps maintain fertility and tilth.

Seeding cultivated areas to suited tame pasture plants helps control soil blowing and improves soil structure. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Management that maintains an adequate grass cover and ground mulch improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

Trees and shrubs grow poorly because this soil is shallow over hard sandstone. They can be grown as windbreaks and environmental plantings, but growth and survival are less than optimum.

The shallowness to hard sandstone severely limits this soil as a site for buildings and waste disposal systems. Excavating for foundations is difficult, and blasting is needed in some areas. If buildings are constructed on this soil, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling. Waste disposal systems should be constructed on the adjacent deeper soils.

Local roads and streets should be graded to shed water, but the hard sandstone makes grading difficult. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Capability unit IIIs-5; Silty range site.

YaB—Yegen loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands. Individual areas are irregular in shape and range from 15 to about 300 acres in size. Slopes are mostly 2 to 6 percent, but some included soils have slopes of less than 2 percent or as much as 9 percent. In some cultivated areas the soil is moderately eroded.

Typically, the surface layer is dark grayish brown loam about 5 inches thick. The subsoil is about 26 inches of friable sandy clay loam. It is brown in the upper part, pale brown in the next part, and pale yellow in the lower part. The lower part is calcareous. The underlying material to a depth of 51 inches is pale yellow, calcareous sandy clay loam. Pale yellow, soft sandstone is at a depth of 51 inches. In some places on the higher parts of the landscape, the depth to sandstone is less than 40 inches. In places the lower part of the subsoil or the underlying material within a depth of 40 inches is silty clay.

Included with this soil in mapping are small areas of Daglum soils, which make up less than 10 percent of the unit. These soils are on foot slopes and in swales. They have a claypan subsoil and contain more sodium than the Yegen soil.

This Yegen soil is medium in fertility and moderately low in content of organic matter and can be easily tilled throughout a wide range in moisture content. Available water capacity is moderate. Permeability is moderate in the subsoil and in the underlying material. The shrink-swell potential is moderate in the subsoil. Runoff is medium.

More than half of the acreage is used for crops. The rest remains in native grass and is used for range and hay. This soil has good potential for crops, tame pasture and hayland, range, openland and rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses. It has fair to poor potential for most engineering uses.

This soil is suited to corn, small grain, alfalfa, and tame grasses. Controlling erosion and soil blowing and conserving moisture are the main concerns if the soil is cropped. Stubble mulch, crop residue management, minimum tillage, contour farming, terraces, and grassed waterways help control erosion and conserve moisture. Wind stripcropping and field windbreaks help control soil blowing. Returning crop residue to the soil helps maintain fertility and tilth.

Seeding cultivated areas to suited tame pasture plants is an effective means of controlling erosion and soil blowing. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is a mixture of tall, mid, and short grasses. Management that maintains an adequate plant cover and ground mulch helps prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

This soil is well suited to windbreaks and environmental plantings. A year of fallow prior to planting a windbreak helps in eliminating grass and weeds and in storing moisture. Planting the trees and shrubs on the contour helps control erosion and conserves moisture.

If buildings are constructed on this soil, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling. Enlarging the absorption area of septic tank filter fields helps to overcome the limited depth to sandstone. Sealing the bottom and sides of sewage lagoons helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Keeping moisture away from the subgrade helps to prevent the road damage caused by frost action or by shrinking and swelling. Capability unit IIe-1; Silty range site.

YaC—Yegen sandy loam, 6 to 9 percent slopes. This deep, well drained, moderately sloping soil is on uplands. Individual areas are irregular in shape and range from 15 to about 150 acres in size. Slopes are dominantly 6 to 9 percent but are as much as 15 percent in some included areas.

Typically, the surface layer is dark grayish brown sandy loam about 5 inches thick. The subsoil is about 26 inches of friable sandy clay loam. It is brown in the upper part, pale brown in the next part, and pale yellow in the lower part. The lower part is calcareous. The underlying material to a depth of 51 inches is pale yellow, calcareous sandy clay loam. Pale yellow, soft sandstone is at a depth of 51 inches. In places the depth to soft sandstone is less than 40 inches. On the lower part of the landscape, the lower part of the subsoil or the underlying material within a depth of 40 inches is silty clay. In places, the surface layer is loam and the subsoil is clay loam.

Included with this soil in mapping are small areas of Daglum, Manning, and Wabek soils, which make up about 5 percent of the unit. Daglum soils are on foot slopes and along drainageways. They have a claypan subsoil and contain more sodium than the Yegen soil. Manning and Wabek soils are on gravelly ridges. Sand and gravel are within a depth of 40 inches in the Manning soils and within a depth of 14 inches in the Wabek soils.

This Yegen soil is medium to low in fertility and moderately low in content of organic matter and can be easily tilled throughout a wide range in moisture content. Available water capacity is moderate. Permeability is moderate in the subsoil and in the underlying material. The shrink-swell potential is moderate in the subsoil. Runoff is slow to medium.

About half of the acreage is cropped. The other half remains in native grass and is used for range. This soil has good potential for range, rangeland wildlife habitat, windbreaks and environmental plantings, and most recreation uses; fair potential for crops, tame pasture and hayland, and openland wildlife habitat; and fair to poor potential for most engineering uses.

This soil is better suited to small grain, alfalfa, and tame grasses than to a row crop, such as corn, because the hazard of erosion is severe. Spring-sown small grain is better suited than winter wheat because the hazard of soil blowing is severe. Controlling soil blowing and erosion and conserving moisture are the main concerns if the soil is cropped. Stubble mulch, crop residue management, minimum tillage, and close-sown crops help control erosion and soil blowing. Contour farming, terraces, and grassed waterways can help to control erosion and conserve moisture unless slopes are too irregular. Wind stripcropping and field windbreaks help control soil blowing. Returning crop residue to the soil helps maintain fertility and tilth.

Seeding cultivated areas to suited tame pasture plants is an effective means of controlling soil blowing and erosion. Bunch grasses should not be planted alone because of the erosion hazard. Proper stocking rates, rotation grazing, applications of fertilizer, and weed control help keep the pasture in good condition after it is established.

This soil is well suited to range. The natural plant cover is a mixture of tall, mid, and short grasses. Management that maintains an adequate grass cover and ground mulch helps to prevent excessive soil losses and improves the moisture supply for range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Proper grazing use and deferred grazing help maintain or improve the range condition.

This soil is well suited to windbreaks and environmental plantings. Keeping a good cover of crop residue on the surface during site preparation helps control soil blowing. Planting the trees and shrubs on the contour helps control erosion and conserves moisture.

If buildings are constructed on this soil, proper design of foundations and footings helps to prevent the structure damage caused by shrinking and swelling. The lower parts of the landscape where the soil are deeper and less sloping are the best sites for waste disposal systems. Enlarging the absorption area of septic tank filter fields helps to overcome the limited depth to sandstone. Sealing the bottom and sides of sewage lagoons helps to prevent excessive seepage.

Local roads and streets should be graded to shed water. Low strength limits the ability of this soil to support vehicular traffic, but strengthening the base material helps to overcome this limitation. Keeping moisture away from the subgrade helps to prevent the road damage caused by frost action and by shrinking and swelling. Roadside erosion-control measures help to control erosion and soil blowing in borrow and cut areas. Capability unit IIIe-8; Sandy range site.

Za—Zeona loamy fine sand, 2 to 9 percent slopes. This deep, excessively drained, undulating and gently rolling soil is on terraces and uplands. Individual areas are irregular in shape and range from 10 to about 300 acres in size. Slopes are short and convex and typically are hummocky.

Typically, the surface layer is grayish brown loamy fine sand about 4 inches thick. The underlying material to a depth of 60 inches is light brownish gray loamy fine sand. In some places on uplands, the lower part of the underlying material is soft sandstone. In some places on valley terraces, the soil is calcareous and is more stratified than is typical for Zeona soils.

Included with this soil in mapping are small areas of Absher, Cabbart, Parchin, and Trembles soils and Fluvaquents. These soils make up about 10 percent of the unit. Absher soils are in low areas between hummocks on the terraces. They have a claypan subsoil and contain sodium. The shallow Cabbart soils are on the tops of some of the ridges on uplands. Fluvaquents are in low wet spots. They have salts at or near the surface. Parchin soils are in low areas on uplands. They have a claypan subsoil and contain sodium. Trembles soils are below the Zeona soil on terraces. They are calcareous and are less sandy than the Zeona soil.

This Zeona soil is low in fertility and in content of organic matter. Available water capacity is low, and permeability is rapid. Runoff is slow.

All areas are in native grass and are used for range. This soil has good potential for range and most engineering uses; fair potential for rangeland wildlife habitat; and poor potential for crops, tame pasture and hayland, windbreaks and environmental plantings, and most recreation uses.

This soil is best suited to range. The natural plant cover is mainly tall and mid grasses. Management that maintains an adequate grass cover and ground mulch helps control soil blowing and improves the moisture supply for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive mid and short grasses and undesirable plants. Under these conditions, some bare ground is evident and the risk of soil blowing is very severe, especially along livestock trails and around livestock watering facilities. Proper grazing use and deferred grazing help maintain or improve the range condition and lessen the chance of sand blowouts.

This soil is not suited to crops, tame pasture and hayland, and windbreaks because of droughtiness and the very severe hazard of soil blowing. Selected trees and shrubs can be scalp planted for environmental purposes if they are provided with additional water and given special care.

This soil has only slight limitations as a site for buildings and local roads and streets, but disturbed areas should be revegetated as soon as possible to control soil blowing. Septic tank absorption fields function well, but the effluent can pollute shallow ground water. Sewage lagoons can be constructed on the included Absher and Parchin soils on the lower parts of the landscape. Capability unit VIe-10; Sands range site.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, rangeland, and woodland, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is 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 also 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, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

M. SCOTT ARGABRIGHT, conservation agronomist, Soil Conservation Service, helped prepare this section.

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

About 430,000 acres in the survey area was used for crops, hayland, and pasture in 1975, according to updated estimates based on the 1967 Conservation Needs Inventory. Of this total, about 27,000 acres was in permanent pasture; about 171,000 acres in close-sown crops, mainly spring wheat, winter wheat, and oats; about 19,000 acres in row crops, mainly corn harvested for silage or grain; 74,000 acres in summer fallow for small grain; 41,000 acres in permanent native or tame hay; 95,000 acres in rotation hay and pasture; and 3,000 acres in conservation use.

The potential of the soils in Perkins County for increased crop production is good. About 192,000 acres of potentially good cropland is currently used as rangeland, about 8,000 acres as pasture, and about 6,000 acres as permanent native hayland. In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology.

Soil erosion and *soil blowing* are the major problems on about 85 percent of the cropland, hayland, and pasture in Perkins County. If the slope is more than 2 percent, erosion is a hazard on Amor, Belfield, Farnuf, Felor, Lawther, Marmarth, Morton, Reeder, Regent, Savage, and Yegen soils.

Loss of the surface layer through erosion or soil blowing results in reduced productivity and in sedimentation. Productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on clayey soils, such as Lawther soils, and on sloping soils that have a claypan subsoil, such as Daglum soils. Erosion also reduces productivity of soils in which available water capacity and rooting depth are limited. Manning and Stady soils, for example, are underlain by sand or gravel 20 to 40 inches below the surface and are droughty. Other examples are soils that have bedded siltstone or sandstone within a depth of 40 inches, such as Amor, Lantry, Lefor, Marmarth, Morton, Reeder, Regent, Vebar, and Watrous soils.

Soil erosion on cropland results in sediment entering streams and lakes. Controlling erosion minimizes the pollution of streams and lakes by sediment and improves water quality for fish and wildlife, recreation, and municipal use.

Erosion control practices provide protective surface cover, reduce runoff, and increase the infiltration rate. A cropping system that keeps a plant cover on the soil for extended periods can hold soil erosion losses to an amount that will not reduce the productive capacity of the soils. Some cropping systems, such as spring wheat followed by a period of fallow, include fallow periods as long as 21 months. When no crop protects the soil, careful management of crop residue is essential. On livestock farms, which require hay and pasture, legume and grass forage crops in the cropping system not only provide nitrogen and improve tilth for the following crop but also reduce the risk of erosion on sloping soils.

Terraces and diversions reduce the length of slopes and the risks of runoff and erosion. They are most practical on deep, well drained soils that have long, smooth slopes, such as Farnuf, Lawther, and Savage soils. Contouring and contour stripcropping are also well suited to these soils and to other soils that have long, smooth slopes, such as Morton and Reeder soils. Morton and Reeder soils are less suitable for terraces and diversions because they have bedded siltstone or sandstone within a depth of 40 inches.

Some of the soils used for crops have slopes that are too short and irregular for contouring and terracing. On these soils, a cropping system that provides substantial plant cover is needed to control erosion. Minimizing tillage and leaving crop residue on the surface increase the infiltration rate and help to reduce the hazards of runoff and erosion. They can be adapted to most soils in the survey area.

Soil blowing is a slight to severe hazard on almost all the soils in the county. The hazard is especially severe on Lefor, Manning, Parshall, Tally, Trembles, Vebar, and Yegen soils. The clayey Lawther soils and the soils that have a high content of lime, such as Lantry soils, also are highly susceptible. Soil blowing can damage these soils in a few hours if winds are strong and the soils are dry and bare of vegetation or surface mulch. Maintaining a plant cover or crop residue or keeping the surface rough through proper tillage minimizes soil blowing on these soils. Windbreaks of suited trees and shrubs also are effective in reducing the risk of soil blowing.

Information on the design of erosion control practices for each kind of soil is contained in the Technical Guide, available in local offices of the Soil Conservation Service.

Soil drainage is not a major management need on most of the soils used for crops, hayland, and pasture in the survey area. The moderately well drained Arnegard and Grail soils are in swales and receive additional moisture as runoff from adjacent soils. Although spring tillage and planting are somewhat delayed in wet years, the additional moisture is beneficial for crops. Artificial drainage is not needed on these soils.

Soil fertility is naturally low on Trembles soils; on some of the Yegen soils; on soils that have a high content of lime, such as the Lantry soils; and on claypan soils, such as Daglum and Parchin soils. Including grasses and legumes in the cropping system helps to maintain fertility. On all soils, additions of fertilizer should be based on the results of soil tests, on the need of the crops, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer to apply.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular and porous.

The surface layer of Lawther, Regent, and Savage soils is silty clay or silty clay loam. These soils can be easily tilled within a narrow range in moisture content. The surface layer of most other soils in the survey area is friable and can be easily tilled throughout a wide range in moisture content.

Field crops suited to the soils and climate of the survey area include close-growing crops and row crops. Spring wheat, alfalfa, oats, and winter wheat are the main close-growing crops. Barley, flax, and rye are also suitable but are grown to a lesser extent. Corn is the main row crop. Sorghum also is grown on a small acreage. On dryland these row crops commonly are harvested for silage.

All commonly grown and climatically suited crops can be grown on most of the soils in the survey area. Early maturing, more drought-resistant small grain or grass is better suited than deeper rooted corn and alfalfa on soils in which porous underlying material limits rooting depth and the water storage capacity, such as Manning and Stady soils. Belfield, Daglum, and Parchin soils have a claypan subsoil that restricts root penetration and releases moisture slowly to plants. These soils also are better suited to early maturing small grain than to corn. Corn is best suited on deep, moderately well drained and well drained soils in which available water capacity is high, such as Arnegard, Farnuf, and Grail soils.

Pasture plants best suited to the climate and to most of the soils in the survey area include alfalfa, intermediate wheatgrass, and pubescent wheatgrass. Crested wheatgrass is well suited on soils that tend to be droughty, such as Manning and Stady soils, and on soils that are low in fertility and high in content of lime, such as Lantry soils. Because of the erosion hazard, a bunch-type species, such as crested wheatgrass, should not be planted alone if the slope is more than 6 percent.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil.

The estimated yields were based mainly on the experience 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 yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 5.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and 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 residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

The estimated yields reflect the productive capacity of the soils for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are 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 horticultural crops or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit (*6*). These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main 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 contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability unit is identified in the description of each soil mapping unit in the section "Soil maps for detailed planning." Capability units are soil groups within the subclasses. 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. 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-1 or IIIe-8.

Rangeland

C. M. SCHUMACHER, range conservationist, Soil Conservation Service, helped prepared this section.

About 75 percent of Perkins County is range. More than half of the farm income is derived from livestock, principally cattle. Cow-calf-steer operations are dominant throughout the county. The average size of ranches is about 3,000 acres.

On many ranches the forage produced on rangeland is supplemented by crop stubble. In winter the native forage is often supplemented with native or tame hay and feed grains or protein concentrate. On some ranches calves and yearlings are creep-fed to increase market weight.

Soils strongly influence the natural vegetation. In the southern part of the county, many of the soils have a claypan subsoil near the surface. These soils support more short grasses, and potential productivity is low because of the limited rooting depth. Soils along the major streams are deep and sandy or loamy. The potential productivity of these soils is greater than that of strongly sloping to steep, shallow soils. The soils throughout the rest of the county are generally moderately deep or deep over soft bedrock. They can produce a luxuriant stand of mixed grasses.

Where climate and topography are about the same, differences in the kind and amount of vegetation that rangeland can produce are related closely to the kind of soil. Effective management is based on the relationships among soils, vegetation, and water.

Table 6 shows, for each kind of soil, the name of the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the expected percentage of each species in the composition of the potential natural plant community. Soils not listed cannot support a natural plant community of predominately grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. The following are explanations of column headings in table 6.

A *range site* is a distinctive kind of rangeland that differs from other kinds of rangeland in its ability to produce a characteristic natural plant community. Soils that produce a similar kind, amount, and proportion of range plants are grouped into range sites. For those areas where the relationship between soils and vegetation has been established, range sites can be interpreted directly from the soil map. Properties that determine the capacity of the soil to supply moisture and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production refers to the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year the amount and distribution of precipitation and the temperatures are such that growing conditions are substantially better than average; in a normal year these conditions are about average for the area; in an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight refers to the total air-dry vegetation produced per acre each year by the potential natural plant community. Vegetation that is highly palatable to livestock and vegetation that is unpalatable are included. Some of the vegetation can also be grazed extensively by wildlife.

Characteristic species of grasses, grasslike plants, forbs, and shrubs that make up most of the potential natural plant community on each soil are listed by common name. Under *Composition*, the expected proportion of each species is presented as the percentage, in air-dry weight, of the total annual production of herbaceous and woody plants. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season. Generally all of the vegetation produced is not used.

Range management requires, in addition to knowledge of the kinds of soil and the potential natural plant community, an evaluation of the present condition of the range vegetation in relation to its potential. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the maximum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

The natural grass cover in many parts of the survey area has been depleted by continued excessive use. In places the amount of forage produced is less than half of that originally produced. The potential for increasing the productivity of the range in the survey area is good if effective management based on soil survey information and rangeland inventories is applied.

Native woods and windbreaks

DAVID L. HINTZ, forester, Soil Conservation Service, helped prepare this section.

Perkins County has approximately 6,300 acres of native trees and shrubs. The soils that support trees and shrubs are not classified as woodland soils. The trees and shrubs generally are on range sites where soil and water relationships are favorable for their establishment and growth. They have spread and are spreading from their original sites probably because prairie fires are no longer common in the area.

Scattered individual plants or clumps of ponderosa pine, Rocky Mountain juniper, silver buffaloberry, skunkbush sumac, and several species of wild rose grow in favorable areas of Blackhall, Cabba, Cabbart, Cohagen, and Twilight soils, primarily on north-facing slopes and in the Cedar Canyon area. Plains cottonwood, sandbar willow, peachleaf willow, and several species of wild rose grow in scattered clumps or groves on the Banks and Trembles soils along the Grand River and the Moreau River. American elm, American plum, boxelder, common chokecherry, green ash, hackberry, silver buffaloberry, western snowberry, and several species of rose commonly grow on Shambo and Trembles soils along the tributaries of the Grand River and the Moreau River.

The early settlers valued the woody vegetation as a source of fuel and food. Currently, the native trees and shrubs are used chiefly for wildlife habitat.

Windbreaks have been planted since the days of the early settlers. The early plantings were made mainly for the protection of the farmstead and livestock. These types of plantings are still needed. In recent years field windbreaks have been planted to help control soil blowing. Windbreaks are needed on thousands of acres in the county.

Windbreaks are established to protect livestock, buildings, and yards from wind and snow. Windbreaks also help protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing 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 depending on erodibility of the soil. They protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. A healthy planting 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 7 shows the height that locally grown trees and shrubs are expected to reach on various kinds of soil in 20 years. The estimates in table 7, 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 local offices of the Soil Conservation Service or the Cooperative Extension Service or from nurserymen.

Wildlife habitat

JOHN B. FARLEY, biologist, Soil Conservation Service, helped prepare this section.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 8, 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 for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* 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. Moderately intensive management is 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 must be intensive. 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, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. 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, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, barley, and sunflower.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. 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, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are intermediate wheatgrass, smooth bromegrass, sweetclover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. 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, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, Missouri goldenrod, beggarweed, western wheatgrass, and blue grama.

Hardwood trees are planted trees and shrubs that provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of hardwood trees are American plum, common chokecherry, green ash, Russian-olive, and silver buffaloberry.

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. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, inland saltgrass, and prairie cordgrass and rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are shallow dugouts, level ditches, marshes, and embankment ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include gray partridge, ring-necked pheasant, meadowlark, mourning dove, robin, fox squirrel, cottontail, whitetail jackrabbit, and red fox.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, American coot, herons, shore birds, redwing blackbird, muskrat, mink, and beaver.

Rangeland habitat consists of areas of wild herbaceous plants and shrubs. Wildlife attracted to rangeland include pronghorn antelope, coyote, white-tailed deer, mule deer, red fox, prairie dog, whitetail jackrabbit, bobcat, greater prairie chicken, western meadowlark, lark bunting, sharp-tailed grouse, and horned lark.

Recreation

Shadehill Reservoir, which formed by a dam on the Grand River and is the largest body of water in the county, provides swimming, boating, fishing, and water skiing. Picnic areas and camp areas are along the shores of Shadehill Reservoir and in the nearby Llewellyn Johns Recreation Area adjacent to Flat Creek Dam. Smaller bodies of water in the county, including Coal Springs Dam and Lemmon Lake, also provide fishing.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 11, and interpretations for dwellings without basements and for local roads and streets, given in table 10.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables 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 the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high 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.

On the basis of information assembled about soil properties, ranges of values can 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 can 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 ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative 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; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are 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 these data, however, should be well understood. First, the data are generally not presented for soil material 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, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 10 shows, for each kind of soil, the degree and kind of limitations for building site development; table 11, for sanitary facilities. Table 13 shows the kind of limitations for water management. Table 12 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

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

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 10. A *slight* limitation indicates that soil properties generally 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 made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high 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 the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 10 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 of the structure from settling or shear failure of the foundation does 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, 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 large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 10 have an all-weather surface that can carry light to medium traffic all year. They consist of a 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 design and construction of roads and streets. The classifications of the soil 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.

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 affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 11 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally 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 designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, or *poor*, which, respectively, mean about the same as the terms *slight*, *moderate*, and *severe*.

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 those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 11 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the 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 factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 12 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.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where 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 some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material 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 their profile. The estimated engineering properties in table 14 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential 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 other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 12 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 14.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils 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 and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; 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 generally 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.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 13 the 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 embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to 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. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Irrigation is affected by such features as slope, susceptibility to flooding, hazards of water erosion and soil blowing, texture, presence of salts and alkali, 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. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Soil properties

Extensive data about soil properties 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 selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of 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 soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features and engineering test data.

Engineering properties

Table 14 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 14 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 14 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in 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 are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, 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 classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class 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 classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified 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 in group 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 higher for the poorest. The AASHTO classification for soils tested in the survey area, with group index numbers in parentheses, is given in table 17. The estimated classification, without group index numbers, is given in table 14. Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled 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 consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also 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.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterburg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 15 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil 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, soil texture, and soil 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 values. 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 selecting the crops, ornamental plants, 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 degrees C. Estimates are based on field and laboratory measurements at representative sites of the nonirrigated soils. The salinity of individual irrigated fields is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of individual fields can differ greatly from the value given in table 15. Salinity affects the suitability of a soil for crop production, its stability when used as a 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 the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to 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 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, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is 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 0.43. To estimate 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 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

Table 16 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape 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.

High water table is the highest level 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 in many borings made during the course of the soil survey. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only 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, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations 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 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also 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 results from the movement of soil moisture into the freezing temperature zone in the soil, which causes ice lenses to form. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil 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.

Engineering test data

The results of analyses of engineering properties of several typical soils of the survey area are given in table 17.

The data presented are for soil samples that were collected from carefully selected sites. The soil profiles sampled are typical of the series discussed in the section "Soil series and morphology." The soil samples were analyzed by the South Dakota Department of Transportation, Division of Highways.

The methods used in obtaining the data are listed by code in the next paragraph. Most of the codes, in parentheses, refer to the methods assigned by the American Association of State Highway and Transportation Officials. The codes for shrinkage and Unified classification are those assigned by the American Society for Testing and Materials.

The methods and codes are AASHTO classification (M-145-66); Unified classification (D-2487-69); mechanical analysis (T88-57); liquid limit (T89-60); plasticity index (T90-56); and moisture-density, method A (T99-57).

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*4*). Unless otherwise noted, colors described are for dry soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or map units, of each soil series are described in the section "Soil maps for detailed planning."

Absher series

The Absher series consists of deep, moderately well drained and well drained, very slowly permeable soils formed in alluvium and in material weathered from soft bedrock. These soils are on terraces and uplands. Slopes range from 0 to 15 percent.

Absher soils are similar to Rhoades soils and are near Belfield, Loburn, and Parchin soils. Belfield, Loburn, and Parchin soils have a thicker A horizon than Absher soils. In addition, Parchin soils are fine-loamy. Belfield soils have a smooth surface. Loburn and Parchin soils are on microrises adjacent to Absher soils. Rhoades soils have a mollic epipedon.

Typical pedon of Absher loam, in an area of Absher-Loburn loams, 0 to 9 percent slopes, 1,400 feet south and 1,868 feet west of the northeast corner of sec. 9, T. 13 N., R. 13 E.

A2—0 to 2 inches; light brownish gray (2.5Y 6/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; neutral; abrupt wavy boundary.

B21t—2 to 6 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; strong coarse columnar structure; extremely hard, firm, sticky and plastic; mildly alkaline; clear wavy boundary.

B22t—6 to 11 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to strong medium blocky; extremely hard, firm, sticky and plastic; moderately alkaline; clear irregular boundary.

B3cs—11 to 21 inches; pale olive (5Y 6/3) clay loam, olive (5Y 5/3) moist; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; common fine and medium accumulations of gypsum and other salts; strong effervescence; moderately alkaline; clear wavy boundary.

C1—21 to 39 inches; light olive gray (5Y 6/2) clay loam, olive gray (5Y 5/2) moist; weak medium and fine subangular blocky structure; very hard, firm, sticky and plastic; strong effervescence; moderately alkaline; clear irregular boundary.

C2cs—39 to 50 inches; light olive gray (5Y 6/2) clay loam, olive gray (5Y 5/2) moist; massive; very hard, firm, sticky and plastic; common medium accumulations of gypsum and other salts; strong effervescence; moderately alkaline; clear irregular boundary.

C3—50 to 60 inches; gray (5Y 6/1) clay, olive gray (5Y 5/2) moist; massive; very hard, firm, very sticky and very plastic; slight effervescence; moderately alkaline.

Bedded siltstone or sandstone typically is at a depth of 60 inches or more but is as shallow as 40 inches in some pedons. The depth to accumulations of gypsum and other salts ranges from 10 to 21 inches. The thickness of the solum ranges from 7 to 28 inches.

An A1 horizon less than 2 inches thick is in some pedons. The A2 horizon has color value of 6 or 7 (3 or 4 moist) and chroma of 2 or 3. It is dominantly loam but is silt loam, clay loam, or clay in some pedons. It is neutral or mildly alkaline and is 1 inch to 4 inches thick. The B2t horizon has color value of 4 to 6 and chroma of 1 to 3. It is clay loam or clay and averages between 35 and 50 percent clay. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 1 to 3. It is moderately alkaline or strongly alkaline.

Amor series

The Amor series consists of moderately deep, well drained, moderately permeable soils formed in material weathered from soft sandstone, siltstone, and loamy shale. These soils are on uplands. Slopes range from 2 to 15 percent.

Amor soils are similar to Felor, Morton, Reeder, and Yegen soils and are near Cabba, Lantry, Lefor, and Vebar soils. Cabba soils are shallow to bedrock and generally are steeper than Amor soils. Felor, Lefor, Morton, Reeder, and Yegen soils have an argillic horizon. Their position on the landscape is similar to that of Amor soils. Lantry soils lack a mollic epipedon and generally are steeper than Amor soils. Vebar soils contain more sand than Amor soils.

Typical pedon of Amor loam, in an area of Reeder-Amor loams, 2 to 6 percent slopes, 390 feet north and 350 feet east of the southwest corner of sec. 24, T. 23 N., R. 14 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak and moderate coarse subangular blocky structure parting to moderate medium granular; slightly hard, very friable, slightly sticky; neutral; abrupt smooth boundary.

B2—8 to 13 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; moderate medium and coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; neutral; abrupt wavy boundary.

B3ca—13 to 25 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; many fine accumulations of carbonates; strong effervescence; mildly alkaline; clear irregular boundary.

Cca—25 to 34 inches; light yellowish brown (2.5Y 6/3) loam, olive brown (2.5Y 4/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky; many medium accumulations of carbonates; strong effervescence; moderately alkaline; abrupt smooth boundary.

Cr—34 to 60 inches; light yellowish brown (2.5Y 6/3) soft bedded loamy siltstone, light olive brown (2.5Y 5/3) moist; moderately alkaline.

The depth to bedrock ranges from 20 to 40 inches. The depth to free carbonates ranges from 10 to 20 inches. The thickness of the solum ranges from 10 to 28 inches.

The A horizon has color value of 4 or 5 (2 or 3 moist) and chroma of 2 or 3. It is slightly acid or neutral and is 5 to 9 inches thick. The B2 horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 to 5 moist), and chroma of 2 or 3. It is loam or sandy clay loam and averages between 18 and 25 percent clay. Some pedons lack a B3 horizon. The C horizon has color value of 6 or 7 (4 to 6 moist) and chroma of 2 to 4. It is loam or sandy clay loam and is mildly alkaline or moderately alkaline. The underlying bedrock is soft, fine grained sandstone, siltstone, or loamy shale and commonly is stratified.

Arnegard series

The Arnegard series consists of deep, moderately well drained, moderately permeable soils formed in local alluvium. These soils are in swales on uplands and terraces. Slopes range from 0 to 2 percent.

Arnegard soils are similar to Farnuf, Grail, Parshall, and Shambo soils and are near Morton and Reeder soils. Farnuf, Morton, Reeder, and Shambo soils have a mollic epipedon that is less than 16 inches thick. They generally are above Arnegard soils on the landscape. Grail soils are fine textured. Parshall soils are coarse-loamy.

Typical pedon of Arnegard loam, 2,140 feet east and 400 feet north of the southwest corner of sec. 24, T. 23 N., R. 10 E.

A1—0 to 11 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; neutral; clear wavy boundary.

B21—11 to 20 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; neutral; clear wavy boundary.

B22—20 to 25 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; neutral; clear wavy boundary.

B23—25 to 31 inches; grayish brown (2.5Y 5/2) loam, olive brown (2.5Y 4/3) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine accumulations of carbonates; slight effervescence; neutral; clear wavy boundary.

B3ca—31 to 40 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many fine accumulations of carbonates; violent effervescence; moderately alkaline; clear wavy boundary.

C1ca—40 to 46 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine accumulations of carbonates; violent effervescence; moderately alkaline; clear wavy boundary.

C2—46 to 60 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, friable; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 40 inches. The mollic epipedon is more than 16 inches thick and extends into the B horizon. The depth to free carbonates ranges from 23 to more than 40 inches.

The A horizon has color value of 4 or 5 (2 or 3 moist). It is loam or silt loam and is 8 to 13 inches thick. The B2 horizon has color value of 3 to 5 (2 to 4 moist) and chroma of 2 or 3. It is dominantly loam, but it is light clay loam or silt loam in some pedons. The C horizon has color value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. It is loam, fine sandy loam, or clay loam.

Banks series

The Banks series consists of deep, excessively drained or somewhat excessively drained, rapidly permeable soils formed in alluvium. These soils are on bottom land. Slopes range from 0 to 2 percent.

Banks soils are near Trembles soils and are similar to Zeona soils. Trembles soils contain more clay than Banks soils and are coarse-loamy. Zeona soils lack free carbonates within a depth of 36 inches. They are on nearby uplands and terraces.

Typical pedon of Banks loamy fine sand, 243 feet west and 2,100 feet south of the northeast corner of sec. 9, T. 19 N., R. 13 E.

A1—0 to 6 inches; light brownish gray (2.5Y 6/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; single grained; loose; slight effervescence; neutral; abrupt wavy boundary.

C1—6 to 11 inches; light gray (2.5Y 7/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; soft, very friable; slight effervescence; mildly alkaline; abrupt wavy boundary.

C2—11 to 17 inches; light brownish gray (2.5Y 6/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; single grained; loose; some sand grains stained very dark gray when moist; slight effervescence; mildly alkaline; abrupt wavy boundary.

C3—17 to 24 inches; light gray (2.5Y 7/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable; slight effervescence; mildly alkaline; abrupt wavy boundary.

C4—24 to 60 inches; light gray (2.5Y 7/2) fine sand, grayish brown (2.5Y 5/2) moist; single grained; loose; some sand grains stained olive brown (2.5Y 3/4) or very dark gray (2.5Y 3/1) when moist; slight effervescence; moderately alkaline.

Free carbonates are at the surface or within a depth of 10 inches.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 or 2. It is dominantly loamy fine sand, but it is sandy loam, loam, silty clay loam, or loamy sand in some pedons. It is neutral or mildly alkaline and is 2 to 7 inches thick. The C horizon has color value of 5 to 7 (4 to 6 moist) and chroma of 1 to 3. It averages loamy fine sand or fine sand and commonly is stratified with thin lenses of finer or coarser textured material. A buried A horizon is in some pedons.

Belfield series

The Belfield series consists of deep, well drained soils formed in local alluvium and in material weathered from soft bedrock. These soils are in swales and broad valleys on uplands and terraces. Permeability is moderately slow in the solum and slow or moderately slow in the underlying material. Slopes range from 0 to 9 percent.

Belfield soils are similar to Grail, Lawther, Regent, and Savage soils and commonly are adjacent to Daglum, Farnuf, Grail, Marmarth, Morton, Regent, Rhoades, and Savage soils on the landscape. Daglum and Rhoades soils lack a B&A horizon and have columnar structure. Farnuf, Grail, Lawther, Marmarth, Morton, Regent, and Savage soils lack a natric horizon. They generally are above Belfield soils on the landscape.

Typical pedon of Belfield silt loam, in an area of Belfield-Grail silt loams, 0 to 2 percent slopes, 528 feet east and 264 feet south of the northwest corner of sec. 10, T. 19 N., R. 16 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak thin and medium platy structure; soft, very friable; slightly acid; clear smooth boundary.

A12—5 to 10 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium platy; slightly hard, very friable; neutral; clear wavy boundary.

B&A—10 to 12 inches; grayish brown (10YR 5/2) silty clay (B2t), very dark grayish brown (10YR 3/2) moist, and light brownish gray (10YR 6/2) silt loam (A2), dark gray (10YR 4/1) moist; moderate medium and fine subangular blocky structure; slightly hard, friable, sticky; neutral; clear smooth boundary.

B21t—12 to 20 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; strong fine prismatic structure parting to strong fine and medium blocky; very hard, very firm, sticky and plastic; mildly alkaline; gradual smooth boundary.

B22t—20 to 27 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; slight effervescence; strongly alkaline; gradual wavy boundary.

B3cacs—27 to 39 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common nests of gypsum crystals; few fine accumulations of carbonates; slight effervescence; moderately alkaline; gradual wavy boundary.

C1cacs—39 to 50 inches; grayish brown (2.5Y 5/2) clay loam, olive brown (2.5Y 4/3) moist; massive; hard, friable, sticky and plastic; common nests of gypsum crystals; common fine and medium accumulations of carbonates; slight effervescence; moderately alkaline; gradual wavy boundary.

C2—50 to 60 inches; light olive brown (2.5Y 5/3) sandy clay loam, olive brown (2.5Y 4/3) moist; massive; slightly hard, friable, sticky; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 24 to 45 inches. The depth to free carbonates ranges from 20 to 32 inches. The mollic epipedon ranges from 7 to 24 inches in thickness.

The A horizon has color value of 4 or 5 (2 or 3 moist). It is dominantly silt loam, but it is loam, silty clay loam, or clay loam in some pedons. It is 5 to 10 inches thick. Some pedons have an A2 or A&B horizon. The B2t horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 to 5 moist), and chroma of 2 or 3. It is clay loam, silty clay loam, clay, or silty clay and averages between 35 and 45 percent clay. The C horizon has color value of 5 or 6 (4 or 5 moist) and chroma of 2 to 4. Soft sandstone or siltstone is below a depth of 40 inches in some pedons.

Blackhall series

The Blackhall series consists of shallow, well drained, moderately permeable soils formed in material weathered from soft sandstone. These soils are on uplands. Slopes range from 15 to 40 percent.

Blackhall soils are similar to Cabba, Cabbart, and Cohagen soils and commonly are adjacent to Cabbart, Lantry, Marmarth, and Twilight soils on the landscape. Cabba and Cabbart soils contain more clay and less sand than Blackhall soils. Cohagen soils are dry for shorter periods than Blackhall soils. Lantry, Marmarth, and Twilight soils are moderately deep over bedrock. They generally are below Blackhall soils on the landscape.

Typical pedon of Blackhall fine sandy loam, in an area of Blackhall-Cabbart complex, 15 to 40 percent slopes, 2,320 feet east and 1,140 feet north of the southwest corner of sec. 14, T. 15 N., R. 14 E.

A1—0 to 3 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; soft, very friable; many fine roots; mildly alkaline; clear smooth boundary.

C1—3 to 7 inches; light yellowish brown (2.5Y 6/3) fine sandy loam, olive brown (2.5Y 4/3) moist; weak medium subangular blocky structure; soft, very friable; many fine roots; few threads of carbonates; strong effervescence; moderately alkaline; clear wavy boundary.

C2ca—7 to 13 inches; light brownish gray (2.5Y 6/2) light fine sandy loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; soft, very friable; many fine roots; many threads of carbonates; violent effervescence; moderately alkaline; gradual wavy boundary.

Cr—13 to 60 inches; pale olive (5Y 6/3) soft bedded sandstone, olive (5Y 5/3) moist; strong effervescence; moderately alkaline.

The depth to soft bedded sandstone ranges from 10 to 20 inches. Free carbonates are at the surface or within a depth of 10 inches. Fragments of sandstone, generally less than 3 inches in diameter, are in some pedons.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. It is dominantly fine sandy loam, but it is sandy loam in some pedons. It is neutral or mildly alkaline and is 2 to 8 inches thick. The C horizon has hue of 2.5Y or 5Y, value of 6 or 7 (4 to 6 moist), and chroma of 2 to 4. It is mildly alkaline or moderately alkaline. Some pedons lack accumulations of carbonates.

Cabba series

The Cabba series consists of shallow, well drained, moderately permeable soils formed in material weathered from soft siltstone or sandstone. These soils are on uplands. Slopes range from 2 to 40 percent.

Cabba soils are similar to Blackhall, Cohagen, and Wayden soils and commonly are adjacent to Amor, Cohagen, Lantry, Morton, Reeder, and Wayden soils on the landscape. Amor, Morton, and Reeder soils have a mollic epipedon. They generally are below Cabba soils on the landscape. Blackhall and Cohagen soils contain more sand and less clay than Cabba soils. Lantry soils are moderately deep over bedrock. They generally are below Cabba soils on the landscape. Wayden soils contain more clay than Cabba soils.

Typical pedon of Cabba loam, in an area of Cabba-Lantry loams, 15 to 40 percent slopes, 3,130 feet west and 780 feet north of the southeast corner of sec. 25, T. 19 N., R. 13 E.

A1—0 to 3 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium and fine granular structure; soft, very friable; mildly alkaline; clear wavy boundary.

C—3 to 14 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; weak fine and medium subangular blocky structure; soft, friable, slightly sticky; violent effervescence; moderately alkaline; clear wavy boundary.

Cr—14 to 60 inches; light gray (2.5Y 7/2) softbedded siltstone, light yellowish brown (2.5Y 6/3) moist; easily dug with spade; violent effervescence; moderately alkaline.

The depth to soft siltstone or sandstone ranges from 8 to 20 inches. The content of rock fragments ranges from 0 to 35 percent. The rock fragments are mainly of gravel or cobble size. Free carbonates are at the surface or within a depth of 10 inches.

The A horizon has hue of 10YR or 2.5Y and value of 5 or 6 (3 or 4 moist). It is dominantly loam, but it is silt loam or fine sandy loam in some pedons. It is neutral or mildly alkaline and is 2 to 5 inches thick. The C horizon has color value of 5 to 7 (4 to 6 moist) and chroma of 2 or 3. It is loam, silt loam, clay loam, or silty clay loam and averages between 20 and 35 percent clay.

Cabbart series

The Cabbart series consists of shallow, somewhat excessively drained and excessively drained soils formed in material weathered from soft siltstone or sandstone. These soils are on uplands. Permeability is moderately slow or slow. Slopes range from 15 to 40 percent.

Cabbart soils are similar to Blackhall, Cabba, Cohagen, and Wayden soils and commonly are adjacent to Absher, Blackhall, Lantry, Loburn, Marmarth, Parchin, and Twilight soils on the landscape. Absher, Loburn, and Parchin soils have a natric horizon. They generally are below Cabbart soils on the landscape. Blackhall, Cohagen, and Twilight soils contain more sand than Cabbart soils. Lantry soils are moderately deep over soft bedrock. Cabba soils are dry for shorter periods than Cabbart soils. Marmarth soils have a mollic epipedon. Wayden soils contain more clay than Cabbart soils.

Typical pedon of Cabbart loam, in an area of Blackhall-Cabbart complex, 15 to 40 percent slopes, 2,000 feet west and 609 feet south of the northeast corner of sec. 29, T. 13 N., R. 15 E.

A1—0 to 2 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak fine and very fine granular structure; soft, very friable, slightly sticky and slightly plastic; mildly alkaline; abrupt wavy boundary.

AC—2 to 6 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure parting to weak fine subangular blocky and weak fine granular; slightly hard, very friable; mildly alkaline; gradual wavy boundary.

C1—6 to 12 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium and fine subangular blocky; soft, friable; strong effervescence; mildly alkaline; clear wavy boundary.

C2ca—12 to 18 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure; horizontal bedding planes evident; soft, very friable; common threads of carbonates along horizontal bedding planes; strong effervescence; mildly alkaline; gradual wavy boundary.

Cr—18 to 60 inches; light brownish gray (2.5Y 6/2) and light yellowish brown (2.5Y 6/4) soft bedded sandstone, grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) moist; mildly alkaline.

The depth to soft bedded siltstone or sandstone ranges from 10 to 20 inches. Free carbonates are at the surface or within a depth of 10 inches.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 to 5 moist), and chroma of 2 or 3. It is loam or silt loam and is 1 inch to 4 inches thick. Some pedons lack an AC horizon. The C horizon has hue of 10YR, 2.5Y, or 5Y; value of 6 or 7 (4 to 6 moist); and chroma of 2 to 4. It is loam, silt loam, clay loam, or silty clay loam and averages between 20 and 35 percent clay.

Cohagen series

The Cohagen series consists of shallow, well drained to excessively drained soils formed in material weathered from soft sandstone. These soils are on uplands. Permeability is moderately rapid. Slopes range from 2 to 40 percent.

Cohagen soils are similar to Cabba, Cabbart, and Wayden soils and commonly are adjacent to Amor, Cabba, Lantry, Reeder, Tally, and Vebar soils on the landscape. Amor, Reeder, Tally, and Vebar soils have a mollic epipedon. They generally are below Cohagen soils on the landscape. Lantry soils are moderately deep over bedrock. They are below Cohagen soils on the landscape. Cabba, Cabbart, and Wayden soils contain more clay than Cohagen soils.

Typical pedon of Cohagen loamy very fine sand, in an area of Cohagen-Vebar complex, 15 to 40 percent slopes, 1,200 feet north and 2,640 feet west of the southeast corner of sec. 25, T. 20 N., R. 13 E.

A1—0 to 3 inches; brown (10YR 5/3) loamy very fine sand, dark brown (10YR 3/3) moist; single grained; loose; slight effervescence; neutral; abrupt smooth boundary.

C—3 to 16 inches; pale brown (10YR 6/3) loamy very fine sand, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; soft, very friable; strong effervescence; mildly alkaline; abrupt smooth boundary.

Cr—16 to 60 inches; pale brown (10YR 6/3) and pale yellow (2.5Y 7/4) soft weakly bedded sandstone, brown (10YR 5/3) and light yellowish brown (2.5Y 6/4) moist; slight effervescence; mildly alkaline.

The depth to soft bedded sandstone ranges from 8 to 20 inches. Free carbonates are at the surface or within a depth of 8 inches.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 2 or 3. It is loamy very fine sand, fine sandy loam, or sandy loam and is neutral or mildly alkaline. It is 2 to 6 inches thick. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. It is loamy very fine sand, fine sandy loam, or sandy loam and is mildly alkaline or moderately alkaline.

Daglum series

The Daglum series consists of deep, well drained and moderately well drained, very slowly permeable soils formed in alluvium. These soils are on uplands and terraces. Slopes range from 0 to 9 percent.

Daglum soils are similar to Absher, Belfield, Loburn, Parchin, and Rhoades soils and commonly are adjacent to Belfield, Farnuf, Felor, Regent, Rhoades, and Savage soils on the landscape. Absher, Loburn, and Parchin soils lack a mollic epipedon. Belfield soils have a B&A horizon and lack columnar structure. Farnuf, Felor, Regent, and Savage soils lack a natric horizon. They generally are in convex areas above Daglum soils. Rhoades soils have an A horizon that is less than 5 inches thick.

Typical pedon of Daglum loam, in an area of Savage-Daglum complex, 0 to 2 percent slopes, 1,750 feet east and 660 feet north of the southwest corner of sec. 9, T. 17 N., R. 14 E.

A11—0 to 2 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium and thin platy structure; soft, very friable, slightly sticky; slightly acid; clear wavy boundary.

A12—2 to 5 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate coarse subangular blocky structure parting to moderate fine and medium subangular blocky; slightly hard, friable, slightly sticky; slightly acid; abrupt wavy boundary.

A2—5 to 7 inches; gray (10YR 6/1) silt loam, very dark gray (10YR 3/1) moist; weak thick platy structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; slightly acid; abrupt smooth boundary.

B21t—7 to 11 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; strong medium and coarse columnar structure parting to strong medium blocky; extremely hard, very firm, sticky and plastic; neutral; gradual wavy boundary.

B22t—11 to 17 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong medium prismatic structure parting to strong medium blocky; extremely hard, very firm, sticky and plastic; mildly alkaline; gradual wavy boundary.

C1cacs—17 to 30 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse subangular blocky structure; hard, very firm, sticky and plastic; common nests of gypsum crystals; strong effervescence; moderately alkaline; gradual irregular boundary.

C2—30 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, very firm, sticky and plastic; slight effervescence; moderately alkaline.

The thickness of the solum typically is 16 to 24 inches but ranges from 12 to 30 inches. The depth to free carbonates and accumulations of salts ranges from 12 to 30 inches.

The A1 horizon has color value of 4 or 5 (2 or 3 moist). It typically is loam, but it is silt loam or clay loam in some pedons. It is slightly acid or neutral and is 4 to 10 inches thick. The A2 horizon has hue of 10YR or 2.5Y and value of 5 to 7 (3 to 5 moist). It is loam, silt loam, or clay loam. It is slightly acid or neutral and is 1 inch to 4 inches thick. The B2t horizon has color value of 4 to 6 (3 to 5 moist) and chroma of 2 or 3. It is clay, silty clay, or clay loam and averages between 35 and 50 percent clay. It is neutral to moderately alkaline. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 or 3. It is silty clay loam, silty clay, or clay and is moderately alkaline or strongly alkaline. Soft siltstone or shale is between depths of 40 and 60 inches in some pedons.

Dimmick series

The Dimmick series consists of deep, very poorly drained, very slowly permeable soils formed in alluvium. These soils are in closed depressions in the uplands. Slopes are 0 to 1 percent.

Dimmick soils are mapped with Heil soils and commonly are adjacent to those soils and to Arnegard, Belfield, Daglum, Farnuf, Grail, Morton, Reeder, Regent, and Savage soils on the landscape. Arnegard and Grail soils are better drained than Dimmick soils and are in nearby swales. Belfield and Daglum soils have a natric horizon. They are well drained or moderately well drained and are in nearby swales and on foot slopes. Farnuf, Morton, Reeder, Regent, and Savage soils are well drained. They are on adjacent uplands and terraces. Heil soils have a natric horizon.

Typical pedon of Dimmick silty clay, in an area of Dimmick and Heil soils, 2,170 feet east and 1,300 feet south of the northwest corner of sec. 12, T. 20 N., R. 12 E.

Ap—0 to 6 inches; gray (10YR 5/1) silty clay, very dark brown (10YR 2/2) moist; common fine and distinct mottles, yellowish brown (10YR 5/6) moist; moderately fine and fine subangular blocky structure; very hard, friable, sticky and plastic; slightly acid; abrupt smooth boundary.

A12g—6 to 12 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; strong fine and medium blocky structure; very hard, firm, sticky and plastic; slightly acid; clear wavy boundary.

A13g—12 to 40 inches; gray (5Y 5/1) clay, very dark gray (5Y 3/1) moist; weak very coarse prismatic structure parting to strong medium and coarse blocky; very hard, firm, sticky and plastic; neutral; clear wavy boundary.

C1g—40 to 48 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; massive; very hard, firm, sticky and plastic; mildly alkaline; clear wavy boundary.

C2g—48 to 60 inches; gray (5Y 6/1) and pale olive (5Y 6/3) clay, gray (5Y 5/1) and light olive brown (2.5Y 5/3) moist; massive; very hard, firm, sticky and plastic; few fine accumulations of carbonates; slight effervescence; mildly alkaline.

The depth to free carbonates ranges from 25 to 60 inches. Some pedons have an O horizon. This horizon is 1 inch to 3 inches thick. Mottles are throughout some pedons.

The A horizon has color value of 3 to 5 (2 or 3 moist) and chroma of 1 to 3. It is 15 to 40 inches thick. The C horizon has color value of 5 or 6 (4 or 5 moist) and is clay or silty clay.

Farnuf series

The Farnuf series consists of deep, well drained, moderately permeable soils formed in alluvium. These soils are on terraces and in upland valleys. Slopes range from 0 to 6 percent.

Farnuf soils are similar to Arnegard, Morton, Reeder, and Shambo soils and commonly are adjacent to Arnegard, Belfield, Daglum, Grail, Manning, Morton, Reeder, Shambo, Stady, and Tally soils on the landscape. Arnegard and Grail soils have a mollic epipedon that is more than 16 inches thick. They are in swales. Belfield and Daglum soils have a natric horizon. They are in swales. Manning and Stady soils have sand and gravel within 40 inches of the surface. Morton and Reeder soils have bedrock within 40 inches of the surface. They are on adjacent uplands. Shambo and Tally soils lack an argillic horizon.

Typical pedon of Farnuf loam, 0 to 2 percent slopes, 875 feet east and 1,125 feet north of the southwest corner of sec. 7, T. 17 N., R. 10 E.

Ap—0 to 8 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; neutral; abrupt smooth boundary.

B2t—8 to 16 inches; brown (10YR 5/3) light clay loam, dark brown (10YR 3/3) crushing to dark grayish brown (10YR 4/2) moist; moderate medium and coarse prismatic structure parting to moderate medium and coarse blocky; hard, friable, slightly sticky and slightly plastic; neutral; abrupt wavy boundary.

B3ca—16 to 25 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak very coarse prismatic structure parting to moderate coarse subangular blocky; slightly hard, friable, sticky and slightly plastic; few fine accumulations of carbonates; violent effervescence; mildly alkaline; clear wavy boundary.

C1ca—25 to 35 inches; light yellowish brown (2.5Y 6/3) loam, light olive brown (2.5Y 5/3) moist; weak very coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine accumulations of carbonates; violent effervescence; moderately alkaline; gradual wavy boundary.

C2—35 to 60 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 15 to 27 inches. The depth to free carbonates ranges from 12 to 18 inches. The mollic epipedon is 8 to 12 inches thick and includes all or part of the B2t horizon in some pedons.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3. It is 5 to 8 inches thick. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 2 or 3. It is loam, clay loam, or silty clay loam and averages between 25 and 35 percent clay. It is neutral or mildly alkaline. The B3ca and C horizons have hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. They are loam or light clay loam. Sand and gravel are below a depth of 40 inches in some pedons.

Felor series

The Felor series consists of deep, well drained soils formed in loamy material overlying clayey sediments. These soils are on uplands. Permeability is moderate in the upper part of the solum and slow in the underlying material. Slopes range from 2 to 9 percent.

Felor soils are similar to Amor, Lefor, Morton, Reeder, and Yegen soils and commonly are adjacent to Belfield, Daglum, Lefor, Morton, Reeder, and Yegen soils on the landscape. Amor soils lack an argillic horizon. Belfield and Daglum soils have a natric horizon. They are in swales and on foot slopes. Lefor, Morton, and Reeder soils have bedrock at a depth of 20 to 40 inches. Their position on the landscape is similar to that of Felor soils. Yegen soils have a less clayey C horizon than Felor soils.

Typical pedon of Felor loam, in an area of Felor-Yegen loams, 2 to 6 percent slopes, 282 feet east and 72 feet south of the northwest corner of sec. 23, T. 18 N., R. 15 E.

Ap—0 to 5 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak very coarse subangular blocky structure parting to weak fine and medium granular; slightly hard, friable, slightly sticky and slightly plastic; few pebbles; many fine and medium roots; slightly acid; abrupt wavy boundary.

A12—5 to 11 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; slightly acid; clear wavy boundary.

B21t—11 to 28 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; moderate fine prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, slightly sticky and plastic; few fine roots; few pebbles; shiny films on faces of peds; slightly acid; gradual wavy boundary.

IIB22—28 to 34 inches; pale yellow (5Y 7/3) silty clay, pale olive (5Y 6/3) moist; strong fine and medium prismatic structure parting to moderate fine and medium blocky; hard, firm, sticky and plastic; shiny films on faces of peds; few fine roots; mildly alkaline; abrupt wavy boundary.

IIB3ca—34 to 39 inches; light brown (7.5YR 6/4) and pale yellow (5Y 7/3) silty clay, brown (7.5YR 5/4) and pale olive (5Y 6/3) moist; moderate fine and medium prismatic structure parting to weak medium subangular blocky; hard, firm, sticky and plastic; common fine and medium accumulations of carbonates; strong effervescence; moderately alkaline; abrupt wavy boundary.

IIC—39 to 60 inches; white (2.5Y 8/2) and light reddish brown (5YR 6/3) silty clay, reddish brown (5Y 5/3) and light brownish gray (2.5Y 6/2) moist; few fine distinct mottles, yellowish brown (10YR 5/6) moist; massive; laminated; hard, firm, sticky and plastic; few fine accumulations of carbonates; strong effervescence; moderately alkaline.

The thickness of the solum typically is 25 to 40 inches but ranges from 17 to 55 inches. The depth to free carbonates typically is 30 to 40 inches but ranges from 17 to 48 inches. The depth to contrasting clayey sediments typically is 20 to 35 inches. Few or common pebbles are in the upper part of the solum. A pebble line commonly is at the boundary between the contrasting sediments.

The A horizon has color value of 4 or 5 (2 or 3 moist) and chroma of 2 or 3. It is loam, fine sandy loam, or sandy loam and is slightly acid or neutral. It is 7 to 15 inches thick. The B2t horizon has hue of 7.5YR, 10YR, or 2.5Y; value of 5 or 6 (4 or 5 moist); and chroma of 2 to 4. It is sandy clay loam or clay loam and averages between 25 and 35 percent clay and between 40 and 65 percent sand. It is slightly acid or neutral. Some pedons have a B3 horizon or a C horizon, or both, that formed in loamy sediments.

The IIB22 horizon has hue of 7.5YR to 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is silty clay or silty clay loam and averages between 35 and 50 percent clay. It is mildly alkaline or moderately alkaline. Some pedons lack a IIB22 horizon. The IIB3 and IIC horizons have hue of 5YR to 5Y, value of 5 to 8 (4 to 6 moist), and chroma of 2 to 4. They are silty clay or silty clay loam and are mildly alkaline or moderately alkaline. Some pedons lack a IIB3 horizon. Siltstone or sandstone is at a depth of 40 to 60 inches in some pedons.

Grail series

The Grail series consists of deep, moderately well drained, moderately slowly permeable soils formed in alluvium. These soils are in swales and on foot slopes on uplands and terraces. Slopes range from 0 to 2 percent.

Grail soils are similar to Arnegard, Lawther, and Savage soils and commonly are adjacent to Belfield, Daglum, Farnuf, Morton, Reeder, Regent, and Savage soils on the landscape. Arnegard soils are fine-loamy. Belfield and Daglum soils have a natric horizon. Farnuf, Morton, Reeder, Regent, and Savage soils have a mollic epipedon that is less than 16 inches thick. They are well drained and generally are slightly above Grail soils on the landscape. Lawther soils lack an argillic horizon and are well drained.

Typical pedon of Grail silt loam, 2,100 feet north and 150 feet west of the southeast corner of sec. 20, T. 19 N., R. 16 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium and fine subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly sticky; neutral; abrupt smooth boundary.

A12—5 to 9 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to weak very fine and fine subangular blocky; slightly hard, friable, slightly sticky; slightly acid; gradual wavy boundary.

B21t—9 to 21 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium blocky; hard, firm, sticky; neutral; clear smooth boundary.

B22t—21 to 31 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate coarse prismatic structure parting to moderate medium blocky and subangular blocky; hard, firm, sticky; neutral; clear wavy boundary.

B3—31 to 42 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, firm, sticky; slight effervescence; moderately alkaline; clear wavy boundary.

C—42 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 50 inches. The depth to free carbonates ranges from 20 to 42 inches. The mollic epipedon is more than 16 inches thick and includes all or part of the B2t horizon.

The A horizon has color value of 4 or 5 (2 or 3 moist). It is silt loam or silty clay loam and is 6 to 12 inches thick. The B2t horizon has color value of 4 or 5 (3 or 4 moist). It is silty clay loam, silty clay, or clay and averages between 35 and 45 percent clay. Some pedons have a B3ca or Cca horizon. The C horizon has color value of 5 or 6 (4 or 5 moist) and is silty clay loam or silt loam. It is mildly alkaline or moderately alkaline.

Heil series

The Heil series consists of deep, poorly drained, very slowly permeable soils formed in alluvium. These soils are in closed depressions in the uplands. Slopes are 0 to 1 percent.

Heil soils are mapped with Dimmick soils and commonly are adjacent to those soils and to Arnegard, Belfield, Daglum, Farnuf, Grail, Morton, Reeder, Regent, Rhoades, and Savage soils on the landscape. Arnegard and Grail soils lack a natric horizon. They are better drained than Heil soils and are in nearby swales. Belfield and Daglum soils have a thicker A horizon than Heil soils. Also, they are better drained and are in nearby swales and on foot slopes. Dimmick soils lack a natric horizon. Their position on the landscape is similar to that of Heil soils. Farnuf, Morton, Reeder, Regent, and Savage soils lack a natric horizon. They are well drained and are on adjacent uplands. Rhoades soils are moderately well drained.

Typical pedon of Heil silty clay loam, in an area of Dimmick and Heil soils, 780 feet east and 90 feet north of the southwest corner of sec. 23, T. 21 N., R. 10 E.

A2—0 to 3 inches; gray (10YR 6/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium and coarse subangular blocky structure parting to weak thin platy; slightly hard, friable, slightly sticky and plastic; slightly acid; abrupt wavy boundary.

B21t—3 to 7 inches; dark gray (2.5Y 4/1) silty clay, black (2.5Y 2/1) moist; moderate medium columnar structure parting to strong medium and coarse blocky; extremely hard, very firm, sticky and plastic; neutral; clear wavy boundary.

B22t—7 to 25 inches; dark gray (2.5Y 4/1) silty clay, black (2.5Y 2/1) moist; moderate medium and coarse prismatic structure parting to strong medium and coarse blocky; extremely hard, very firm, sticky and plastic; moderately alkaline; clear wavy boundary.

B31ca—25 to 36 inches; gray (2.5Y 5/1) silty clay, very dark gray (2.5Y 3/1) moist; moderate coarse subangular blocky structure; very hard, firm, sticky and plastic; common fine threads of carbonates on faces of peds; strong effervescence; strongly alkaline; clear wavy boundary.

B32ca—36 to 42 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; weak medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; few fine accumulations of carbonates; strong effervescence; strongly alkaline; clear wavy boundary.

C1—42 to 48 inches; pale olive (5Y 6/3) silty clay, olive (5Y 4/3) moist; massive; hard, friable, sticky and plastic; strong effervescence; strongly alkaline; clear wavy boundary.

IIC2g—48 to 53 inches; olive yellow (2.5Y 6/6) and light gray (2.5Y 7/2) sandy loam, light olive brown (2.5Y 5/4) and light brownish gray (2.5Y 6/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; strong effervescence; strongly alkaline; clear wavy boundary.

IIC3g—53 to 60 inches; yellow (2.5Y 7/6) and white (5Y 8/1) sandy loam, olive yellow (2.5Y 6/6) and light gray (5Y 7/2) moist; massive; soft, very friable, slightly sticky and slightly plastic; strong effervescence; strongly alkaline.

The thickness of the solum ranges from 10 to 45 inches. The depth to free carbonates ranges from 15 to 36 inches.

The A2 horizon has hue of 10YR, 2.5Y, or 5Y and value of 4 to 6 (3 to 5 moist). It is dominantly silty clay loam, but it is silt loam or silty clay in some pedons. It is slightly acid or neutral and is 1 inch to 4 inches thick. The B2t horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 or 5 (2 to 4 moist); and chroma of 1 or 2. It is silty clay or clay. Some pedons lack a B3 horizon. Visible accumulations of salts are in the B3 and C horizons in some pedons. Some pedons lack a contrasting IIC horizon.

Lantry series

The Lantry series consists of moderately deep, well drained, moderately permeable soils formed in material weathered from soft siltstone and sandstone. These soils are on uplands. Slopes range from 2 to 40 percent.

Lantry soils are similar to Cabba soils and are commonly adjacent to Amor, Cabba, Cabbart, Cohagen, Morton, Reeder, Vebar, and Wayden soils on the landscape. Amor, Morton, Reeder, and Vebar soils have a mollic epipedon. They typically are less steep than Lantry soils and are lower on the landscape. Cabba, Cabbart, Cohagen, and Wayden soils are shallow over soft bedrock.

Typical pedon of Lantry loam, in an area of Morton-Lantry loams, 2 to 9 percent slopes, 680 feet south and 1,770 feet west of the northeast corner of sec. 4, T. 16 N., R. 15 E.

A1—0 to 2 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; strong effervescence; mildly alkaline; clear wavy boundary.

B2—2 to 6 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; violent effervescence; mildly alkaline; gradual wavy boundary.

B3—6 to 11 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; many fine faint mottles of light gray (2.5Y 7/2); weak medium and coarse prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; violent effervescence; mildly alkaline; clear wavy boundary.

C1ca—11 to 19 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; many fine accumulations of carbonates; violent effervescence; mildly alkaline; gradual wavy boundary.

C2ca—19 to 26 inches; light brownish gray (2.5Y 6/2) heavy silt loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; many fine accumulations of carbonates; violent effervescence; mildly alkaline; clear wavy boundary.

Cr—26 to 60 inches; light brownish gray (2.5Y 6/2) soft interbedded siltstone and sandstone, grayish brown (2.5Y 5/2) moist; few fine roots in the upper part; few fine accumulations of carbonates in seams; violent effervescence; mildly alkaline.

The depth to soft bedrock ranges from 20 to 40 inches. The thickness of the solum ranges from 6 to 20 inches. Free carbonates are at the surface or within a depth of 10 inches. The soils are mildly alkaline or moderately alkaline.

The A horizon has hue of 2.5Y or 10YR, value of 5 or 6 (3 to 5 moist), and chroma of 2 or 3. It is loam, silt loam, or very fine sandy loam and is 2 to 4 inches thick. The B and C horizons have hue of 2.5Y or 10YR, value of 5 to 7 (4 or 5 moist), and chroma of 2 or 3. They are loam, silt loam, or very fine sandy loam. The B3 and C horizons have few to many accumulations of carbonates.

Lawther series

The Lawther series consists of deep, well drained, slowly permeable soils formed in clayey sediments. These soils are on uplands. Slopes range from 0 to 9 percent.

Lawther soils are similar to Belfield, Grail, Regent, and Savage soils and commonly are adjacent to Belfield, Daglum, Dimmick, Felor, Heil, Morton, and Reeder soils on the landscape. Belfield and Daglum soils have a natric horizon. They are in swales and on foot slopes. Dimmick and Heil soils are very poorly drained and poorly drained and are in closed depressions. Felor, Grail, Morton, Reeder, Regent, and Savage soils have an argillic horizon. Also, Felor and Reeder soils are fine-loamy, Morton soils are fine-silty, and Grail soils are moderately well drained and are in swales.

Typical pedon of Lawther silty clay, 2 to 6 percent slopes, 120 feet south and 87 feet west of the northeast corner of sec. 27, T. 18 N., R. 14 E.

Ap—0 to 5 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; weak fine granular structure; hard, firm, sticky and plastic; slight effervescence; mildly alkaline; abrupt smooth boundary.

A12—5 to 8 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak fine and medium prismatic structure parting to weak fine and medium subangular blocky; very hard, firm, sticky and plastic; slight effervescence; moderately alkaline; abrupt wavy boundary.

B21—8 to 20 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; moderate coarse prismatic structure parting to moderate medium blocky; very hard, very firm, sticky and plastic; slight effervescence; moderately alkaline; gradual wavy boundary.

B22—20 to 28 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; strong coarse and medium blocky structure; very hard, very firm, very sticky and very plastic; slight effervescence; moderately alkaline; gradual wavy boundary.

B3—28 to 39 inches; gray (5Y 6/1) clay, gray (5Y 5/1) moist; moderate coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; many tongues and stains of black (2.5Y 2/0); slight effervescence; moderately alkaline; clear irregular boundary.

C1—39 to 43 inches; light gray (5Y 7/2) clay, gray (5Y 6/1) moist; massive; very hard, very firm, very sticky and very plastic; few tongues and stains of black (2.5Y 2/0); slight effervescence; moderately alkaline; gradual irregular boundary.

C2—43 to 60 inches; light gray (5Y 7/2) clay, gray (5Y 6/1) moist; massive; very hard, very firm, very sticky and very plastic; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to more than 40 inches. Carbonates are typically at the surface, but some pedons lack carbonates in the upper 20 inches. The mollic epipedon is 7 to more than 20 inches thick. When the soil is dry, cracks 1/2 inch to 2 inches wide and several feet long extend downward through the solum.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It typically is silty clay, but it is clay or silty clay loam in some pedons. It is 4 to 10 inches thick. The B2 horizon has hue of 2.5Y or 5Y, value of 4 or 5 (2 to 4 moist), and chroma of 1 or 2. It is clay or silty clay and averages between 45 and 60 percent clay and between 30 and 50 percent silt. Some pedons have a B3ca horizon. The C horizon has color value of 4 to 7 (3 to 6 moist) and chroma of 1 to 3.

Lefor series

The Lefor series consists of moderately deep, well drained, moderately permeable soils formed in material weathered from soft sandstone. These soils are on uplands. Slopes range from 2 to 6 percent.

Lefor soils are similar to Felor, Reeder, Tally, Vebar, and Yegen soils and commonly are adjacent to Amor, Arnegard, Cabba, and Reeder soils on the landscape. Amor soils lack an argillic horizon. Arnegard soils have a mollic epipedon that is more than 16 inches thick. They are in swales. Cabba soils lack a mollic epipedon and are shallow to bedrock. They generally are above Lefor soils on the landscape. Felor soils have a clayey IIC horizon. Reeder soils contain less sand in the B2t horizon than Lefor soils. Tally and Vebar soils lack an argillic horizon and are coarse-loamy. Yegen soils are more than 40 inches deep over soft bedrock.

Typical pedon of Lefor fine sandy loam, 2 to 6 percent slopes, 129 feet south and 66 feet east of the northwest corner of sec. 10, T. 22 N., R. 10 E.

A1—0 to 7 inches; dark brown (10YR 4/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure parting to weak fine and very fine granular; soft, very friable; neutral; abrupt wavy boundary.

B21t—7 to 12 inches; yellowish brown (10YR 5/4) sandy clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; neutral; clear wavy boundary.

B22t—12 to 19 inches; yellowish brown (10YR 5/4) sandy clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; mildly alkaline; clear wavy boundary.

B23t—19 to 24 inches; light olive brown (2.5Y 5/4) sandy clay loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; mildly alkaline; gradual wavy boundary.

B3—24 to 29 inches; light olive brown (2.5Y 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; mildly alkaline; gradual wavy boundary.

Cca—29 to 37 inches; light brownish gray (2.5Y 6/2) fine sandy loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, friable; few fine and medium accumulations of carbonates; slight effervescence; moderately alkaline; gradual wavy boundary.

Cr—37 to 60 inches; light yellowish brown (2.5Y 6/4) soft bedded sandstone that crushes easily to sandy loam, olive brown (2.5Y 4/4) moist; slight effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 15 to 40 inches. The depth of soft sandstone ranges from 20 to 40 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3. It is fine sandy loam or sandy loam and is 5 to 9 inches thick. The B2t horizon has color value of 5 or 6 (4 or 5 moist) and chroma of 2 to 4. It is sandy clay loam, loam, or sandy loam and averages between 18 and 27 percent clay and more than 45 percent fine sand or coarser sand. Accumulations of carbonates are in the B3ca horizon or the Cca horizon, or both. Some pedons lack a B3 horizon.

Loburn series

The Loburn series consists of deep, well drained, very slowly permeable soils formed in alluvium or in material weathered from soft bedrock. These soils are on uplands and terraces. Slopes range from 0 to 9 percent.

Loburn soils are similar to Belfield, Daglum, and Parchin soils and commonly are adjacent to Absher, Belfield, Blackhall, Lantry, Marmarth, Parchin, and Twilight soils on the landscape. Absher soils have an A horizon that is less than 5 inches thick. Belfield soils lack columnar structure and have a B&A horizon. Blackhall, Lantry, Marmarth, and Twilight soils lack a natric horizon. Daglum soils have a mollic epipedon. Parchin soils are fine-loamy.

Typical pedon of Loburn loam, in an area of Absher-Loburn loams, 0 to 9 percent slopes, 60 feet south and 45 feet east of the northwest corner of sec. 36, T. 14 N., R. 10 E.

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

A2—5 to 9 inches; light gray (10YR 7/1) silt loam, grayish brown (2.5Y 5/2) moist; weak thin platy structure; slightly hard, very friable; slightly acid; abrupt wavy boundary.

B21t—9 to 14 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; strong fine columnar structure parting to strong fine blocky; very hard, firm, sticky and plastic; slightly acid; clear wavy boundary.

B22t—14 to 26 inches; gray (10YR 6/1) clay, dark grayish brown (10YR 4/2) moist; moderate fine and medium prismatic structure parting to strong medium blocky; very hard, firm, slightly sticky and plastic; few white crystals of gypsum; slight effervescence; mildly alkaline; clear wavy boundary.

B3cs—26 to 45 inches; light olive gray (5Y 6/2) silty clay, olive gray (5Y 5/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; common crystals of gypsum; strong effervescence; mildly alkaline; gradual wavy boundary.

C—45 to 60 inches; grayish brown (2.5Y 5/2) clay, olive gray (5Y 4/2) moist; massive; very hard, firm, sticky and plastic; few crystals of gypsum; slight effervescence; moderately alkaline.

The thickness of the solum typically is 30 to 50 inches but ranges from 20 to 60 inches. The depth to free carbonates is 13 to 25 inches. The depth to soft bedrock typically is more than 60 inches but ranges from 40 to more than 60 inches.

The A1 horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 1 or 2. It is silt loam or loam and is medium acid to neutral. It is 2 to 6 inches thick. The A2 horizon has hue of 10YR or 2.5Y, value of 6 or 7 (4 or 5 moist), and chroma of 1 to 3. It typically is silt loam but in some pedons is loam or fine sandy loam. It is medium acid to neutral and is 2 to 7 inches thick. The B2t horizon has hue of 2.5Y or 10YR, value of 5 or 6 (4 or 5 moist), and chroma of 1 to 3. It is clay, silty clay, clay loam, or silty clay loam and is slightly acid to moderately alkaline. Some pedons have few or common accumulations of carbonates. The C horizon has hue of 5Y, 2.5Y, or 10YR; value of 5 to 7 (4 to 6 moist); and chroma of 2 or 3. It is clay, silty clay, clay loam, or sandy clay loam. Some pedons have few to many accumulations of carbonates.

Lohler series

The Lohler series consists of deep, moderately well drained, slowly permeable soils formed in alluvium. These soils are on bottom land. Slopes range from 0 to 2 percent.

Lohler soils are similar to Lawther soils and commonly are adjacent to Absher, Banks, Savage, Shambo, and Trembles soils on the landscape. Absher soils have a natric horizon. They are on terraces. Banks soils are sandy. Lawther soils have a mollic epipedon. They are on uplands. Savage soils have a mollic epipedon and an argillic horizon. They are on terraces. Shambo soils have a mollic epipedon and are fine-loamy. They are on terraces. Trembles soils are coarse-loamy.

Typical pedon of Lohler clay, in an area of Lohler-Trembles complex, 1,250 feet east and 480 feet north of the southwest corner of sec. 30, T. 14 N, R. 13 E.

A1—0 to 6 inches; gray (10YR 5/1) clay, very dark grayish brown (10YR 3/2) moist; weak medium and coarse subangular blocky structure parting to weak fine subangular blocky; very hard, firm, sticky and plastic; neutral; abrupt wavy boundary.

C1—6 to 28 inches; grayish brown (2.5Y 5/2) clay loam stratified with thin lenses of very fine sandy loam, loam, and silt loam, dark grayish brown (2.5Y 4/2) moist; common distinct mottles, yellowish brown (10YR 5/6) moist; weak medium and coarse blocky structure; hard, firm, sticky and plastic; laminations evident; slight effervescence in thin layers; mildly alkaline; clear wavy boundary.

C2—28 to 60 inches; grayish brown (2.5Y 5/2) clay stratified with thin layers of very fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; mildly alkaline.

The clay content between depths of 10 and 40 inches averages between 35 and 60 percent. Some pedons lack free carbonates, but some have free carbonates throughout. The soils are neutral to moderately alkaline. A buried A horizon is below a depth of 20 inches in some pedons.

The A horizon has hue of 10YR or 2.5Y and value of 4 to 6 (3 to 5 moist). It is clay, silty clay, clay loam, or silty clay loam and is 5 to 10 inches thick. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 to 3. It is clay loam, clay, silty clay loam, or silty clay and commonly is stratified with coarser textured material. Loamy fine sand, fine sand, or sand and gravel are below a depth of 40 inches in some pedons.

Manning series

The Manning series consists of somewhat excessively drained soils formed in loamy material overlying sand and gravel at a depth of 20 to 40 inches. These soils are on terraces. Permeability is moderately rapid through the solum and rapid in the underlying sand and gravel. Slopes range from 0 to 6 percent.

Manning soils are similar to Stady and Trembles soils and commonly are adjacent to Farnuf, Parshall, Reeder, Shambo, Stady, Tally, and Wabek soils on the landscape. Farnuf, Reeder, and Shambo soils lack sand and gravel within a depth of 40 inches and are fine-loamy. Parshall and Tally soils also lack sand and gravel within a depth of 40 inches. They are in swales. In addition, Parshall soils have a mollic epipedon that is more than 16 inches thick. Stady soils are fine-loamy over sandy or sandy-skeletal. Trembles soils lack a mollic epipedon and are stratified. They are on bottom land. Wabek soils are sandy-skeletal. They are steeper than Manning soils and generally are on terrace fronts or ridges above or below those soils.

Typical pedon of Manning fine sandy loam, 0 to 6 percent slopes, 1,585 feet north and 95 feet east of the southwest corner of sec. 6, T. 21 N., R. 14 E.

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

B2—4 to 13 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; neutral; clear smooth boundary.

B3—13 to 20 inches; light olive brown (2.5Y 5/3) sandy loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; soft, very friable; mildly alkaline; abrupt smooth boundary.

C1ca—20 to 26 inches; light brownish gray (2.5Y 6/2) sandy loam, light olive brown (2.5Y 5/3) moist; weak coarse subangular blocky structure; loose, very friable; violent effervescence; moderately alkaline; abrupt smooth boundary.

IIC2—26 to 60 inches; light brownish gray (2.5Y 6/2) sand and gravel, light olive brown (2.5Y 5/3) moist; single grained; loose; some pebbles have thin accumulations of carbonates on undersides; strong effervescence; moderately alkaline.

The depth to sand and gravel typically is 20 to 34 inches but ranges from 16 to 40 inches. The thickness of the solum and the depth to free carbonates typically are 13 to 27 inches. The mollic epipedon is 7 to 16 inches thick.

The A horizon has color value of 4 or 5 (2 or 3 moist) and is fine sandy loam or sandy loam. It is 4 to 7 inches thick. The B2 horizon has hue of 10YR or 2.5Y and value of 4 to 6 (3 or 4 moist). It is fine sandy loam or sandy loam. Some pedons lack a B3 horizon. The Cca horizon has hue of 10YR or 2.5Y and value of 5 to 7 (4 to 6 moist). It is fine sandy loam in some pedons.

Marmarth series

The Marmarth series consists of moderately deep, well drained, moderately permeable soils formed in material weathered from soft sandstone. These soils are on uplands. Slopes range from 0 to 9 percent.

Marmarth soils are similar to Morton, Reeder, and Yegen soils and commonly are adjacent to Absher, Belfield, Blackhall, Cabbart, Lantry, Loburn, Parchin, and Twilight soils on the landscape. Absher, Belfield, Loburn, and Parchin soils have a natric horizon. They generally are on foot slopes or in swales and sags. Blackhall and Cabbart soils are shallow over bedrock. Typically, they are steeper than Marmarth soils and are higher or lower on the landscape. Lantry and Twilight soils lack a mollic epipedon and an argillic horizon. They typically are steeper than Marmarth soils. Morton, Reeder, and Yegen soils are not so dry as Marmarth soils.

Typical pedon of Marmarth loam, 2 to 6 percent slopes, 1,970 feet north and 2,175 feet west of the southeast corner of sec. 23, T. 13 N., R. 11 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky; neutral; abrupt wavy boundary.

A12—5 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky; neutral; clear wavy boundary.

B2t—7 to 15 inches; grayish brown (10YR 5/2) heavy loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure; hard, friable, slightly sticky and slightly plastic; neutral; clear wavy boundary.

Cca—15 to 25 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; weak medium and coarse prismatic structure; slightly hard, very friable; common fine and medium accumulations of carbonates; violent effervescence; moderately alkaline; clear wavy boundary.

Cr1—25 to 44 inches; light gray (5Y 7/2) and yellow (5Y 7/6) soft bedded sandstone, olive gray (5Y 5/2) and olive yellow (5Y 6/6) moist; strong effervescence; moderately alkaline; abrupt wavy boundary.

Cr2—44 to 60 inches; light gray (5Y 7/2) soft bedded sandstone, olive gray (5Y 5/2) moist; neutral.

The depth to soft sandstone ranges from 20 to 40 inches. The thickness of the solum ranges from 11 to 30 inches. The depth to free carbonates is 11 to 23 inches. The mollic epipedon is 7 to 15 inches thick.

The A horizon has color value of 4 or 5 and is fine sandy loam in some pedons. It is 5 to 9 inches thick. The B2t horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 2 or 3. It is loam or clay loam and averages between 18 and 35 percent clay. It is neutral or mildly alkaline. Some pedons have a B3 or B3ca horizon. The Cca horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is loam, clay loam, or fine sandy loam.

Morton series

The Morton series consists of moderately deep, well drained, moderately permeable soils formed in material weathered from soft siltstone or sandstone. These soils are on uplands. Slopes range from 0 to 15 percent.

Morton soils are similar to Amor, Farnuf, Felor, Marmarth, Reeder, and Yegen soils and commonly are adjacent to Arnegard, Belfield, Cabba, Daglum, Grail, Lantry, Reeder, Regent, Rhoades, and Vebar soils on the landscape. Amor soils are fine-loamy and lack an argillic horizon. Arnegard and Grail soils have a mollic epipedon that is more than 16 inches thick. They are in swales. Belfield, Daglum, and Rhoades soils have a natric horizon. They generally are on foot slopes or in swales and sags. Cabba and Lantry soils lack a mollic epipedon and an argillic horizon. They generally are steeper than Morton soils. Farnuf, Felor, Marmarth, Reeder, and Yegen soils are fine-loamy. Regent soils are fine textured, and Vebar soils are coarse-loamy.

Typical pedon of Morton loam, in an area of Morton-Lantry loams, 2 to 9 percent slopes, 1,485 feet east and 144 feet south of the northwest corner of sec. 13, T. 18 N., R. 12 E.

Ap—0 to 7 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky; neutral; abrupt wavy boundary.

B2t—7 to 14 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; moderate medium and fine prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; shiny films on ped faces; neutral; abrupt wavy boundary.

B3—14 to 18 inches; pale brown (10YR 6/3) silty clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and plastic; strong effervescence; mildly alkaline; abrupt wavy boundary.

C1ca—18 to 26 inches; light gray (2.5Y 7/2) silty clay loam, light yellowish brown (2.5Y 6/3) moist; weak coarse prismatic structure; slightly hard, friable, slightly sticky and plastic; many medium accumulations of carbonates; strong effervescence; moderately alkaline; clear irregular boundary.

C2—26 to 32 inches; pale olive (5Y 6/3) silty clay loam, olive (5Y 5/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few accumulations of carbonates; strong effervescence; mildly alkaline; abrupt wavy boundary.

Cr—32 to 60 inches; pale olive (5Y 6/3) soft bedded siltstone, olive (5Y 5/3) moist; strong effervescence; mildly alkaline.

The depth to soft bedrock ranges from 20 to 40 inches. The thickness of the solum ranges from 11 to 33 inches and the depth to free carbonates from 11 to 26 inches. The mollic epipedon is 7 to 15 inches thick.

The A horizon has color value of 4 or 5 (2 or 3 moist). It is dominantly loam, but it is silt loam in some pedons. It is 3 to 10 inches thick. The B2t horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 2 or 3. It is loam, clay loam, silt loam, or silty clay loam and averages between 20 and 35 percent clay and less than 15 percent fine sand or coarser sand. Some pedons lack a B3 horizon. The C horizon has hue of 7.5YR to 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4.

Parchin series

The Parchin series consists of moderately deep, well drained soils formed in material weathered from sandstone. These soils are on uplands. Permeability is slow or very slow in the B2t horizon and is moderate below. Slopes range from 0 to 9 percent.

Parchin soils are similar to Loburn and Daglum soils and commonly are adjacent to Absher, Belfield, Loburn, Marmarth, and Twilight soils on the landscape. Absher, Belfield, Daglum, and Loburn soils are fine textured. Marmarth and Twilight soils lack a natric horizon. They generally are above Parchin soils on the landscape.

Typical pedon of Parchin fine sandy loam, in an area of Twilight-MarmarthеParchin association, gently rolling, 900 feet east and 155 feet north of the southwest corner of sec. 16, T. 14 N., R. 12 E.

A11—0 to 3 inches; grayish brown (10YR 5/2) light fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine subangular blocky structure parting to weak fine granular; soft, very friable; many fine roots; medium acid; clear wavy boundary.

A12—3 to 6 inches; brown (10YR 5/3) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium and coarse subangular blocky; soft, very friable; common fine roots; medium acid; clear wavy boundary.

A2—6 to 10 inches; pale brown (10YR 6/3) loamy fine sand, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak medium and fine subangular blocky; soft, very friable; common fine roots; neutral; abrupt wavy boundary.

B21t—10 to 12 inches; grayish brown (2.5Y 5/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium columnar structure parting to moderate medium subangular blocky; very hard, firm, slightly sticky and plastic; thin nearly continuous pale brown (10YR 6/3) coatings on tops of columnar peds; many fine roots along surfaces of peds; mildly alkaline; clear wavy boundary.

B22t—12 to 15 inches; grayish brown (2.5Y 5/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, slightly sticky and plastic; common fine roots; mildly alkaline; clear wavy boundary.

B23t—15 to 18 inches; grayish brown (2.5Y 5/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, slightly sticky and plastic; common fine threads of carbonates; moderately alkaline; clear wavy boundary.

B3ca—18 to 27 inches; light olive gray (5Y 6/2) fine sandy loam, olive gray (5Y 4/2) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, friable; few fine roots; common threads and spots of carbonates; violent effervescence; strongly alkaline; gradual wavy boundary.

Cr1—27 to 37 inches; light gray (5Y 6/1) soft bedded sandstone crushing to loamy fine sand with strata of fine sandy loam and sandy clay loam, dark gray (5Y 4/1) moist; massive; hard, very friable; few threads and spots of carbonates; strong effervescence; strongly alkaline; gradual wavy boundary.

Cr2—37 to 60 inches; light olive gray (5Y 6/2) soft bedded sandstone crushing to sandy clay loam with strata of fine sandy loam and loamy fine sand, olive gray (5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; slight effervescence; moderately alkaline.

The thickness of the solum typically is 25 to 35 inches but ranges from 17 to 45 inches. The depth to carbonates ranges from 13 to 25 inches. The depth to bedrock typically is 25 to 30 inches but ranges from 20 to 40 inches.

The A1 horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 2 or 3. It is strongly acid to slightly acid and is 3 to 7 inches thick. The A2 horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 or 3. It is loamy fine sand or fine sandy loam and is medium acid to neutral. It is 4 to 12 inches thick. The B2t horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. It is sandy clay loam or loam. In some pedons it has fine threads of gypsum in the lower part. The B3 horizon is fine sandy loam, sandy loam, sandy clay loam, or loam and is mildly alkaline to strongly alkaline. It has few to common threads and nests of gypsum and other salts in some pedons.

Parshall series

The Parshall series consists of deep, well drained, moderately rapidly permeable soils formed in alluvium. These soils are on terraces and uplands. Slopes range from 0 to 6 percent.

Parshall soils are similar to Arnegard, Tally, and Trembles soils and commonly are adjacent to Farnuf, Manning, Shambo, Stady, Vebar, and Wabek soils on the landscape. Arnegard soils are fine-loamy. Farnuf and Shambo soils have a mollic epipedon that is less than 16 inches thick and are fine-loamy. Manning and Stady soils have sand and gravel within 40 inches of the surface. Tally soils have a mollic epipedon that is less than 16 inches thick. Trembles soils lack a mollic epipedon and have carbonates at or near the surface. They are on bottom land. Vebar soils have a mollic epipedon that is less than 16 inches thick and have bedrock within 40 inches of the surface. They generally are above Parshall soils on the landscape. Wabek soils are sandy-skeletal. They are on gravelly ridges and terrace fronts.

Typical pedon of Parshall fine sandy loam, 0 to 6 percent slopes, 1,980 feet west and 1,710 feet north of the southeast corner of sec. 8, T. 19 N., R. 13 E.

Ap—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse and very coarse subangular blocky structure parting to moderate medium and fine granular; soft, very friable; neutral; abrupt smooth boundary.

A12—5 to 13 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak coarse and very coarse prismatic structure parting to moderate medium granular; soft, very friable; neutral; clear smooth boundary.

B21—13 to 24 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; weak very coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, very friable; neutral; clear smooth boundary.

B22—24 to 34 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak very coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, very friable; neutral; gradual wavy boundary.

C1—34 to 58 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; mildly alkaline; abrupt smooth boundary.

C2—58 to 60 inches; light brownish gray (2.5Y 6/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, friable; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 20 to 50 inches. The depth to free carbonates ranges from 25 to 60 inches. The mollic epipedon is 16 to 40 inches thick.

The A horizon has color value of 4 or 5 (2 or 3 moist) and is fine sandy loam or sandy loam. It is 8 to 20 inches thick. The B2 horizon has color value of 4 or 5 (3 or 4 moist) and is neutral or mildly alkaline. Some pedons have a B3 horizon. The C horizon is fine sandy loam, sandy loam, loamy fine sand, or loamy sand. Below a depth of 40 inches, it is gravelly sandy loam in some pedons. It is mildly alkaline or moderately alkaline.

Reeder series

The Reeder series consists of moderately deep, well drained, moderately permeable soils formed in material weathered from sandstone. These soils are on uplands. Slopes range from 0 to 9 percent.

Reeder soils are similar to Amor, Farnuf, Felor, Lefor, Marmarth, Morton, Regent, Shambo, and Yegen soils and commonly are adjacent to Arnegard, Belfield, Daglum, Lantry, Lefor, Morton, Regent, Rhoades, and Vebar soils on the landscape. Amor and Lantry soils lack an argillic horizon. Arnegard soils have a mollic epipedon that is more than 16 inches thick. They are in swales. Belfield, Daglum, and Rhoades soils have a natric horizon. They are in swales and on foot slopes. Farnuf and Shambo soils do not have bedrock within a depth of 40 inches. They generally are on terraces. Felor, Lefor, and Yegen soils contain more sand in the B2t horizon than Reeder soils. Marmarth soils are drier than Reeder soils. Morton soils are fine-silty, Regent soils are fine textured, and Vebar soils are coarse-loamy.

Typical pedon of Reeder loam, in an area of Reeder-Lantry loams, 2 to 9 percent slopes, 725 feet south and 135 feet west of the northeast corner of sec. 17, T. 21 N., R. 12 E.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; soft, friable, slightly sticky; neutral; clear wavy boundary.

B21t—5 to 11 inches; brown (10YR 5/3) light clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; moderately alkaline; clear wavy boundary.

B22t—11 to 19 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; moderate medium and coarse prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, friable, sticky and plastic; moderately alkaline; abrupt wavy boundary.

B3ca—19 to 28 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many fine accumulations of carbonates; violent effervescence; moderately alkaline; clear wavy boundary.

C—28 to 32 inches; pale yellow (5Y 7/3) loam, olive (5Y 5/3) moist; massive; slightly hard, very friable; common fragments of soft sandstone; few fine accumulations of carbonates; strong effervescence; moderately alkaline; clear wavy boundary.

Cr—32 to 60 inches; pale olive (5Y 6/3) and light yellowish brown (2.5Y 6/4) soft bedded sandstone, olive (5Y 5/3) and light olive brown (2.5Y 5/4) moist; strong effervescence; moderately alkaline; clear wavy boundary.

The thickness of the solum ranges from 11 to 36 inches. The depth to free carbonates ranges from 11 to 26 inches. The depth to soft sandstone ranges from 20 to 40 inches. The mollic epipedon is 7 to 16 inches thick.

The A horizon has color value of 4 or 5 (2 or 3 moist) and chroma of 2 or 3. It is dominantly loam, but it is silt loam in some pedons. It is slightly acid or neutral and is 5 to 10 inches thick. The B2t horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 to 5 moist), and chroma of 2 to 4. It is loam or clay loam and averages between 18 and 32 percent clay and between 20 and 45 percent fine sand or coarser sand. It is neutral to moderately alkaline. Some pedons lack a B3 horizon. Common or many accumulations of carbonates are in the B3 horizon or the C horizon, or both.

Regent series

The Regent series consists of moderately deep, well drained, slowly permeable soils formed in material weathered from siltstone or shale. These soils are on uplands. Slopes range from 2 to 15 percent.

Regent soils are similar to Belfield, Grail, Morton, and Savage soils and commony are adjacent to Belfield, Daglum, Grail, Lawther, Morton, Reeder, Rhoades, Savage, and Wayden soils on the landscape. Belfield, Daglum, and Rhoades soils have a natric horizon. They are in swales and sags and on foot slopes. Grail soils have a mollic epipedon that is more than 16 inches thick. They are in swales. Lawther soils lack an argillic horizon. Morton soils are fine-silty, and Reeder soils are fine-loamy. Savage soils are more than 40 inches deep over bedrock. They generally are on terraces. Wayden soils lack a mollic epipedon and are less than 20 inches deep over bedrock. They generally are steeper than Regent soils and are higher or lower on the landscape.

Typical pedon of Regent silty clay loam, in an area of Regent-Savage silty clay loams, 2 to 6 percent slopes, 2,160 feet east and 1,640 feet south of the northwest corner of sec. 12, T. 20 E., R. 12 E.

Ap—0 to 5 inches; dark grayish brown (2.5Y 4/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate fine and medium granular structure; slightly hard, friable, sticky and plastic; neutral; abrupt smooth boundary.

B2t—5 to 13 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to moderate fine and medium blocky; hard, firm, sticky and plastic; shiny films on faces of peds; neutral; abrupt wavy boundary.

B3ca—13 to 28 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; few medium accumulations of carbonates; strong effervescence; mildly alkaline; gradual wavy boundary.

Cca—28 to 35 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; few fine distinct mottles of yellowish brown (10YR 5/6); weak medium and coarse subangular blocky structure; hard, firm, sticky and plastic; many medium accumulations of carbonates; violent effervescence; moderately alkaline; abrupt smooth boundary.

Cr—35 to 60 inches; light brownish gray (2.5Y 6/2) soft bedded siltstone, olive brown (2.5Y 4/3) moist; common fine stains of yellowish brown (10YR 5/6); slight effervescence; moderately alkaline.

The thickness of the solum ranges from 12 to 36 inches. The depth to free carbonates is 12 to 24 inches. The depth to soft siltstone or shale ranges from 20 to 40 inches. The mollic epipedon is 7 to 16 inches thick.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3. It is slightly acid or neutral and is 5 to 10 inches thick. The B2t horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 2 or 3. It is silty clay loam or silty clay and averages between 35 and 45 percent clay. It is neutral or mildly alkaline. Some pedons lack a B3 horizon. Some pedons lack a C horizon between the B3 and Cr horizons.

Rhoades series

The Rhoades series consists of deep, moderately well drained, very slowly permeable soils formed in material weathered from soft siltstone or shale. These soils are on uplands and terraces. Slopes range from 0 to 15 percent.

Rhoades soils are similar to Absher soils and commonly are adjacent to Amor, Belfield, Cabba, Daglum, Farnuf, Lantry, Morton, Reeder, and Regent soils on the landscape. Absher soils lack a mollic epipedon. Amor, Farnuf, Morton, Reeder, and Regent soils lack a natric horizon. They generally are above Rhoades soils on the landscape. Belfield and Daglum soils have a thicker A horizon than

Rhoades soils. Cabba and Lantry soils lack a natric horizon and a mollic epipedon and are less than 40 inches deep over bedrock. They generally are steeper than Rhoades soils.

Typical pedon of Rhoades loam, in an area of Rhoades-Daglum-Slickspots complex, 0 to 9 percent slopes, 2,400 feet north and 144 feet west of the southeast corner of sec. 32, T. 17 N., R. 15 E.

A2—0 to 4 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium platy structure parting to moderate very fine subangular blocky; soft, friable; neutral; abrupt wavy boundary.

B21t—4 to 10 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate coarse columnar structure parting to moderate medium and coarse blocky; very hard, firm, sticky and plastic; moderately alkaline; clear wavy boundary.

B22t—10 to 15 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parting to moderate medium blocky; very hard, firm, sticky and plastic; moderately alkaline; abrupt wavy boundary.

B3—15 to 19 inches; grayish brown (2.5Y 5/2) silty clay, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; few accumulations of gypsum; moderately alkaline; clear wavy boundary.

C1cs—19 to 33 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, friable, sticky and plastic; common accumulations of gypsum and other salts; strong effervescence; moderately alkaline; clear wavy boundary.

C2—33 to 43 inches; light yellowish brown (2.5Y 6/4) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, sticky and plastic; few accumulations of salts; strong effervescence; mildly alkaline; clear wavy boundary.

Cr—43 to 60 inches; light yellowish brown (2.5Y 6/4) bedded siltstone, grayish brown (2.5Y 5/2) moist; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 10 to 28 inches. The depth to free carbonates ranges from 7 to 25 inches. The depth to visible accumulations of salts is less than 16 inches. The depth to soft siltstone or shale is more than 40 inches.

Some pedons have a thin A1 horizon. The thickness of the A1 horizon combined with that of the A2 horizon is not more than 5 inches. The A2 horizon has color value of 4 to 6 (3 to 5 moist). It is dominantly loam, but it is silt loam in some pedons. It is slightly acid or neutral. The B2t horizon has hue of 10YR or 2.5Y and value of 4 or 5 (2 to 4 moist). It is silty clay loam, clay loam, silty clay, or clay and averages between 35 and 50 percent clay. It is mildly alkaline to strongly alkaline. The C horizon has hue of 2.5Y or 5Y and value of 5 to 7 (4 or 5 moist). It is silty clay loam, clay loam, loam, or clay.

Savage series

The Savage series consists of deep, well drained, moderately slowly permeable soils formed in alluvium. These soils are on uplands and terraces. Slopes range from 0 to 6 percent.

Savage soils are similar to Grail, Lawther, and Regent soils and commonly are adjacent to Arnegard, Belfield, Daglum, Grail, Morton, Reeder, Regent, and Rhoades soils on the landscape. Arnegard and Grail soils have a mollic epipedon that is more than 16 inches thick. They are in swales. Belfield, Daglum, and Rhoades soils have a natric horizon. Lawther soils lack an argillic horizon. Morton, Reeder, and Regent soils have soft bedrock within 40 inches of the surface. In addition, Morton soils are fine-silty and Reeder soils are fine-loamy.

Typical pedon of Savage silty clay loam, 0 to 2 percent slopes, 1,050 feet north and 195 feet east of the southwest corner of sec. 10, T. 21 N., R. 10 E.

Ap—0 to 5 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine subangular blocky structure parting to moderate fine granular; slightly hard, friable, sticky and plastic; mildly alkaline; abrupt smooth boundary.

B21t—5 to 14 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to strong medium and coarse blocky; hard, firm, sticky and plastic; mildly alkaline; clear wavy boundary.

B22t—14 to 22 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to strong medium and coarse blocky; very hard, firm, sticky and plastic; shiny films on faces of peds; mildly alkaline; abrupt wavy boundary.

B3—22 to 27 inches; light yellowish brown (2.5Y 6/3) clay, light olive brown (2.5Y 5/3) moist; moderate medium and coarse blocky structure; very hard, firm, sticky and plastic; few fine accumulations of carbonates; slight effervescence; moderately alkaline; abrupt wavy boundary.

C1ca—27 to 55 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; massive; very hard, firm, sticky and plastic; many fine accumulations of carbonates; violent effervescence; moderately alkaline; clear wavy boundary.

C2—55 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; many fine prominent mottles, light gray (2.5Y 7/2) moist, few fine prominent mottles, yellowish red (5YR 4/6) moist, and few fine fine distinct mottles, yellowish red (5YR 5/8) moist; massive; hard, friable, sticky and plastic; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 18 to 36 inches. The depth to free carbonates ranges from 14 to 26 inches. The depth to soft bedrock ranges from 40 to more than 60 inches. The mollic epipedon is 7 to 16 inches thick and includes part or all of the B2t horizon.

The A horizon has hue of 10YR or 2.5Y and value of 4 or 5 (2 or 3 moist). It is silty clay loam or heavy silt loam. It is neutral or mildly alkaline and is 4 to 6 inches thick. The B2t horizon has hue of 10YR or 2.5Y and chroma of 2 or 3. It is clay, silty clay, clay loam, or silty clay loam and averages between 35 and 45 percent clay. The B3 and C horizons are mildly alkaline or moderately alkaline. The C horizon has hue of 10YR to 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. It is clay, silty clay, clay loam, gravelly clay loam, or silty clay loam and commonly is stratified with coarser textured material. Soft siltstone or shale is between depths of 40 and 60 inches in some pedons.

Shambo series

The Shambo series consists of deep, well drained, moderately permeable soils formed in alluvium. These soils are on terraces and fans. Slopes range from 0 to 6 percent.

Shambo soils are similar to Amor, Arnegard, and Farnuf soils and commonly are adjacent to Arnegard, Belfield, Farnuf, Manning, Parshall, Rhoades, Stady, Tally, and Trembles soils on the landscape. Amor soils have soft bedrock within 40 inches of the surface. They are on uplands. Arnegard soils have a mollic epipedon that is more than 16 inches thick. They are in swales. Belfield and Rhoades soils have a natric horizon. Farnuf soils have an argillic horizon. Manning and Stady soils are less than 40 inches deep over sand and gravel. Parshall and Tally soils are coarse-loamy. Trembles soils are coarse-loamy and have carbonates at or near the surface. They are on bottom land below Shambo soils.

Typical pedon of Shambo loam, 483 feet west and 2,550 feet south of the northeast corner of sec. 10, T. 19 N., R. 13 E.

A11—0 to 3 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, slightly sticky; neutral; clear wavy boudary.

A12—3 to 8 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine and medium granular; soft, very friable, slightly sticky and slightly plastic; neutral; gradual wavy boundary.

B21—8 to 14 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; mildly alkaline; gradual wavy boundary.

B22—14 to 19 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few accumulations of carbonates; violent effervescence; mildly alkaline; clear wavy boundary.

B3ca—19 to 31 inches; light brownish gray (2.5Y 6/2) loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common accumulations of carbonates; strong effervescence; mildly alkaline; gradual irregular boundary.

C1ca—31 to 42 inches; light yellowish brown (2.5Y 6/3) loam, olive brown (2.5Y 4/3) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky; strong effervescence; moderately alkaline; clear irregular boundary.

IIC2—42 to 60 inches; grayish brown (2.5Y 5/2) gravelly sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; loose, very friable; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 15 to 40 inches. The depth to free carbonates ranges from 14 to 30 inches. The mollic epipedon is 7 to 16 inches thick.

The A horizon has color value of 4 or 5 (2 or 3 moist) and is loam or silt loam. It is 5 to 9 inches thick. The B2 horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 2 or 3. It is loam, silt loam, or clay loam and averages between 18 and 30 percent clay and between 15 and 40 percent fine sand or coarser sand. The C horizon has color value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is dominantly loam and commonly is stratified with coarser or finer textured material below a depth of 40 inches.

Stady series

The Stady series consists of well drained soils formed in loamy alluvium that is moderately deep over sand and gravel. These soils are on terraces. Permeability is moderate through the solum and rapid in the underlying sand and gravel. Slopes range from 0 to 2 percent.

Stady soils are similar to Manning soils and commonly are adjacent to Belfield, Farnuf, Shambo, Tally, and Wabek soils on the landscape. Belfield, Farnuf, Shambo, and Tally soils do not have sand and gravel within a depth of 40 inches. In addition, Belfield soils have a natric horizon, Farnuf soils have an argillic horizon, and Tally soils are coarse-loamy. Manning soils are coarse-loamy over sandy or sandy-skeletal. Wabek soils are less than 14 inches deep over sand and gravel. They are steeper than Stady soils and are on gravelly ridges and terrace fronts above or below those soils.

Typical pedon of Stady loam, 0 to 2 percent slopes, 1,175 feet north and 168 feet east of the southwest corner of sec. 16, T. 20 N., R. 12 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; neutral; abrupt smooth boundary.

B21—6 to 10 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; neutral; clear wavy boundary.

B22—10 to 17 inches; yellowish brown (10YR 5/4) clay loam, dark brown (10YR 4/3) moist; moderate medium and coarse prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; mildly alkaline; abrupt wavy boundary.

B3ca—17 to 24 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; weak very coarse prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many fine accumulations of carbonates; strong effervescence; moderately alkaline; clear wavy boundary.

IIC—24 to 60 inches; light yellowish brown (2.5Y 6/4) sand and gravel, olive brown (2.5Y 4/4) moist; single grained; loose; slight effervescence; moderately alkaline.

The depth to sand and gravel ranges from 20 to 40 inches. The solum is 18 to 30 inches thick. The depth to free carbonates is 15 to 22 inches. The mollic epipedon is 7 to 16 inches thick.

The A horizon has color value of 4 or 5 (2 or 3 moist) and chroma of 2 or 3. It is dominantly loam, but it is silt loam in some pedons. It is 5 to 8 inches thick. The B2 horizon has color value of 4 to 6 (3 or 4 moist) and chroma of 2 to 4. It is loam or light clay loam and averages between 18 and 30 percent clay. The B3 and C horizons have hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. Some pedons have a thin Cca horizon above the IIC horizon. The B3ca and Cca horizons have few to many accumulations of carbonates. In some pedons the sand and gravel in the IIC horizon is mixed with loamy material.

Tally series

The Tally series consists of deep, well drained soils formed in material weathered from sandstone. These soils are on terraces and uplands. Permeability is moderately rapid through the solum and rapid in the underlying material. Slopes range from 0 to 6 percent.

Tally soils are similar to Parshall, Trembles, and Vebar soils and commonly are adjacent to Farnuf, Manning, Stady, and Vebar soils on the landscape. Farnuf soils have an argillic horizon and are fine-loamy. Manning and Stady soils have sand and gravel within 40 inches of the surface. Parshall soils have a mollic epipedon that is more than 16 inches thick. Trembles soils lack a mollic epipedon and have carbonates at or near the surface. They are on bottom land. Vebar soils have bedrock within 40 inches of the surface. They generally are above Tally soils on the landscape.

Typical pedon of Tally fine sandy loam, in an area of Vebar-Tally fine sandy loams, 0 to 6 percent slopes, 2,310 feet south and 1,155 feet west of the northeast corner of sec. 13, T. 20 N., R. 13 E.

A1—0 to 7 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to weak fine granular; soft, very friable; many fine roots; neutral; clear wavy boundary.

B21—7 to 11 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak medium and coarse prismatic structure parting to weak fine and medium subangular blocky; soft, very friable; many fine roots; neutral; clear wavy boundary.

B22—11 to 19 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak medium and fine subangular blocky structure; soft, very friable; many fine roots; neutral; abrupt wavy boundary.

C1ca—19 to 36 inches; very pale brown (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) moist; massive; soft, very friable; few fine roots; few fine accumulations of carbonates; strong effervescence; mildly alkaline; clear wavy boundary.

C2—36 to 60 inches; light gray (2.5Y 7/2) loamy fine sand, grayish brown (2.5Y 5/2) moist; massive; loose; few fine roots; strong effervescence; mildly alkaline.

The thickness of the solum is 13 to 26 inches, and the depth to free carbonates is 13 to 19 inches. The mollic epipedon is 10 to 15 inches thick.

The A horizon has color value of 3 or 4 (2 or 3 moist) and is fine sandy loam or sandy loam. It is 7 to 10 inches thick. Some pedons have a B1 horizon. The B2 horizon has color value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. Some pedons have a B3 or B3ca horizon. The C horizon has color value of 6 or 7 (5 or 6 moist). Some pedons have sand and gravel at a depth of 40 to 60 inches.

Trembles series

The Trembles series consists of deep, well drained soils formed in alluvium. These soils are on bottom land and low terraces. Permeability is moderately rapid. Slopes range from 0 to 6 percent.

Trembles soils are similar to Banks, Parshall, and Tally soils and commonly are adjacent to Banks, Lohler, Manning, Shambo, and Stady soils on the landscape. Banks soils are sandy. Lohler soils are fine textured. Manning, Parshall, Shambo, Stady, and Tally soils have a mollic epipedon. They are on terraces and uplands above Trembles soils. In addition, Manning and Stady soils have sand and gravel within a depth of 40 inches and Shambo soils are fine-loamy.

Typical pedon of Trembles fine sandy loam, 1,287 feet east and 1,254 feet north of the southwest corner of sec. 4, T. 19 N., R. 13 E.

A11—0 to 2 inches; grayish brown (10YR 5/2) 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; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure parting to weak fine granular; soft, very friable; slight effervescence; neutral; clear smooth boundary.

C1—6 to 29 inches; light brownish gray (10YR 6/2) fine sandy loam stratified with lenses of loamy fine sand and very fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure in the upper part; soft, very friable; slight effervescence; mildly alkaline; clear wavy boundary.

C2—29 to 60 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; slight effervescence; mildly alkaline.

Free carbonates are at the surface or within a depth of 6 inches.

The A horizon has hue of 10YR or 2.5Y and value of 5 or 6 (3 or 4 moist). It is neutral or mildly alkaline and is 2 to 6 inches thick. The C horizon has hue of 10YR or 2.5Y and value of 5 or 6 (4 or 5 moist). It is dominantly fine sandy loam or sandy loam and averages less than 18 percent clay. It commonly is stratified with thin layers of finer and coarser textured material ranging from loamy fine sand to loam.

Twilight series

The Twilight series consists of moderately deep, well drained soils formed in material weathered from sandstone. These soils are on uplands. Permeability is moderately rapid. Slopes range from 6 to 15 percent.

Twilight soils are similar to Blackhall, Tally, and Vebar soils and commonly are adjacent to Absher, Blackhall, Cabbart, Lantry, Loburn, Marmarth, and Parchin soils on the landscape. Absher, Loburn, and Parchin soils have a natric horizon. They generally are below Twilight soils on the landscape. Blackhall and Cabbart soils are shallow over bedrock. They are steeper than Twilight soils and generally are higher on the landscape. Lantry soils are fine-silty. Marmarth, Tally, and Vebar soils have a mollic epipedon. Also, Marmarth soils have an argillic horizon and Tally soils are more than 40 inches deep over bedrock.

Typical pedon of Twilight fine sandy loam, in an area of Twilight-Marmarth-Parchin association, gently rolling, 204 feet west and 105 feet north of the southeast corner of sec. 27, T. 14 N., R. 10 E.

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

B2—3 to 10 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; slightly hard, very friable; neutral; clear wavy boundary.

B3—10 to 18 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium and fine subangular blocky; slightly hard, very friable; neutral; abrupt wavy boundary.

C—18 to 34 inches; light gray (2.5Y 7/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; soft, very friable; strong effervescence; mildly alkaline; gradual wavy boundary.

Cr—34 to 60 inches; light gray (2.5Y 7/2) soft bedded sandstone, grayish brown (2.5Y 5/2) moist; strong effervescence; moderately alkaline.

The thickness of the solum is 11 to 22 inches. The depth to carbonates ranges from 6 to 22 inches. The depth to soft sandstone ranges from 20 to 40 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 2 or 3. It is fine sandy loam or sandy loam and is neutral or mildly alkaline. It is 3 to 6 inches thick. The B2 horizon has color value of 5 or 6 (4 or 5 moist) and is fine sandy loam or sandy loam. It is neutral or mildly alkaline. The C horizon has color value of 5 to 7 (4 to 6 moist) and chroma of 2 or 3. In some pedons the Cr horizon lacks free carbonates.

Vebar series

The Vebar series consists of moderately deep, well drained soils formed in material weathered from sandstone. These soils are on uplands. Permeability is moderately rapid. Slopes range from 0 to 25 percent.

Vebar soils are similar to Lefor, Tally, and Twilight soils and commonly are adjacent to Amor, Arnegard, Cohagen, Lefor, Parshall, and Reeder soils on the landscape. Amor, Lefor, and Reeder soils are fine-loamy. Arnegard and Parshall soils have a mollic epipedon that is more than 16 inches thick. They are in swales. Cohagen soils lack a mollic epipedon, are shallow to bedrock, and generally are steeper than Vebar soils. Tally soils are more than 40 inches deep over bedrock. Twilight soils lack a mollic epipedon.

Typical pedon of Vebar fine sandy loam, in an area of Vebar-Tally fine sandy loams, 0 to 6 percent slopes, 486 feet west and 60 feet south of the northeast corner of sec. 13, T. 20 N., R. 13 E.

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

B21—4 to 14 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, very friable, slightly sticky; neutral; gradual wavy boundary.

B22—14 to 23 inches; light yellowish brown (2.5Y 6/3) fine sandy loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to weak coarse and medium subangular blocky; slightly hard, friable, slightly sticky; neutral; gradual wavy boundary.

B3—23 to 28 inches; light yellowish brown (2.5Y 6/3) fine sandy loam, olive brown (2.5Y 4/3) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky; mildly alkaline; abrupt wavy boundary.

Cr—28 to 60 inches; light gray (5Y 7/2) soft bedded sandstone, grayish brown (2.5Y 5/2) moist; slight effervescence; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 15 to 40 inches. The depth to soft bedded sandstone ranges from 20 to 40 inches. The mollic epipedon is 7 to 16 inches thick.

The A horizon has color value of 3 to 5 (2 or 3 moist) and chroma of 2 or 3. It is dominantly fine sandy loam, but it is sandy loam in some pedons. It is 4 to 8 inches thick. The B2 horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 2 or 3. It is fine sandy loam or sandy loam and averages less than 18 percent clay. Free carbonates are in the B3 horizon in some pedons. In some pedons a C horizon of sandy loam, fine sandy loam, or loamy fine sand is above the Cr horizon.

Wabek series

The Wabek series consists of excessively drained, rapidly permeable soils formed in loamy material that is shallow or very shallow over sand and gravel. These soils are on uplands and terraces. Slopes range from 0 to 35 percent.

Wabek soils commonly are adjacent to Cabba, Farnuf, Manning, and Stady soils on the landscape. Cabba soils lack a mollic epipedon and are shallow to soft bedrock. Farnuf soils do not have sand and gravel within a depth of 40 inches. They are on nearby terraces. Manning and Stady soils are more than 20 inches deep over sand and gravel.

Typical pedon of Wabek sandy loam, 9 to 35 percent slopes, 2,500 feet north and 1,200 feet west of the southeast corner of sec. 17, T. 21 N., R. 16 E.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine subangular blocky structure parting to weak fine granular; soft, very friable; slight effervescence; mildly alkaline; abrupt wavy boundary.

C1—5 to 12 inches; grayish brown (10YR 5/2) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; loose; coatings of carbonates on undersides of pebbles; strong effervescence; mildly alkaline; gradual wavy boundary.

IIC2—12 to 60 inches; varicolored sand and gravel; single grained; coatings of carbonates on undersides of pebbles; strong effervescence; mildly alkaline.

The depth to sand and gravel is 7 to 14 inches. Carbonates are typically at the surface, but some pedons are leached in the upper few inches.

The A horizon has color value of 4 or 5 (2 or 3 moist). It is dominantly sandy loam, but in some pedons it is gravelly sandy loam or loam. It is 4 to 8 inches thick. The IIC horizon is sand and gravel, gravelly sand, gravelly loamy sand, or sand. In some pedons the sand and gravel are mixed with fine-earth material.

Watrous series

The Watrous series consists of shallow, well drained, moderately permeable soils formed in loamy material over hard sandstone. These soils are on uplands. Slopes range from 0 to 3 percent.

The Watrous soils in this survey area typically have fractured hard sandstone within a depth of 20 inches and have a less distinct argillic horizon than is typical for the Watrous series. These differences, however, do not significantly alter the use or behavior of the soils.

Watrous soils commonly are adjacent to Belfield, Morton, Reeder, and Vebar soils on the landscape. These adjacent soils lack hard sandstone within a depth of 24 inches. In addition, Belfield soils have a natric horizon, Morton soils are fine-silty, and Vebar soils lack an argillic horizon and are coarse-loamy.

Typical pedon of Watrous loam, shallow, 0 to 3 percent slopes, 900 feet north and 280 feet east of the southwest corner of sec. 23, T. 21 N., R. 10 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate fine and medium granular structure; friable, slightly sticky; medium acid; abrupt smooth boundary.

B21t—5 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate medium prismatic structure parting to moderate medium blocky; slightly hard, friable, slightly sticky and slightly plastic; slightly acid; clear wavy boundary.

B22t—8 to 14 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine fragments of hard sandstone; neutral; abrupt irregular boundary.

Cr1—14 to 25 inches; white (10YR 8/2) fractured hard sandstone, grayish brown (10YR 5/2) moist; cracks filled with brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; slight effervescence; mildly alkaline; abrupt wavy boundary.

Cr2—25 to 60 inches; pale yellow (2.5Y 7/3) soft bedded sandstone, light yellowish brown (2.5Y 6/3) moist; strong effervescence; mildly alkaline.

The thickness of the solum, the depth to carbonates, and the depth to fractured sandstone typically are less than 20 inches but range from 14 to 24 inches.

The A horizon has color value of 4 or 5 (2 or 3 moist) and chroma of 2 or 3. It is dominantly loam, but it is silt loam in some pedons. It is medium acid to neutral and is 4 to 8 inches thick. The B2t horizon has hue of 10YR or 2.5Y and value of 4 to 6 (2 to 4 moist). It is loam or clay loam and averages between 20 and 30 percent clay. It is slightly acid to mildly alkaline. Some pedons have a thin B3 or C horizon above the hard sandstone. The fractured hard sandstone generally is less than 15 inches thick and is underlain by soft sandstone.

Wayden series

The Wayden series consists of shallow, well drained, slowly permeable soils formed in material weathered from siltstone or shale. These soils are on uplands. Slopes range from 2 to 25 percent.

Wayden soils are similar to Cabba, Cabbart, and Cohagen soils and commonly are adjacent to Cabba, Cabbart, Grail, Lantry, Morton, Reeder, and Regent soils on the landscape. Cabba, Cabbart, and Cohagen soils contain less clay than Wayden soils. Grail soils have a mollic epipedon that is more than 16 inches thick. They are in swales. Lantry soils are more than 20 inches deep over bedrock and are fine-silty. Morton, Reeder, and Regent soils have a mollic epipedon and an argillic horizon and are moderately deep over bedrock. They generally have a more gentle slope than Wayden soils and are lower on the landscape.

Typical pedon of Wayden silty clay loam, in an area of Regent-Wayden silty clay loams, 6 to 15 percent slopes, 1,780 feet east and 1,410 feet north of the southwest corner of sec. 32, T. 22 N., R. 11 E.

A1—0 to 2 inches; light yellowish brown (2.5Y 6/3) silty clay loam, olive brown (2.5Y 4/4) moist; moderate medium granular structure; slightly hard, friable, sticky and plastic; strong effervescence; mildly alkaline; abrupt smooth boundary.

C—2 to 13 inches; pale olive (5Y 6/3) silty clay loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few fine accumulations of carbonates; strong effervescence; moderately alkaline; clear wavy boundary.

Cr—13 to 60 inches; light gray (2.5Y 7/2) soft bedded shale, grayish brown (2.5Y 5/2) moist; common fine distinct stains, olive brown (2.5Y 4/4) moist; slight effervescence; moderately alkaline.

The depth to soft bedded shale or siltstone is 10 to 20 inches. Free carbonates are commonly at the surface, but some pedons are leached in the upper 2 or 3 inches. The A and C horizons overlying the shale or siltstone are silty clay loam, silty clay, clay loam, or clay and average between 35 and 50 percent clay.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 2 to 4. It is 2 to 4 inches thick. The C horizon has color value of 6 or 7 (4 to 6 moist) and chroma of 2 to 4.

Yegen series

The Yegen series consists of deep, well drained soils formed in material weathered from soft sandstone. These soils are on uplands. Permeability is moderate through the solum and in the underlying material. Slopes range from 2 to 9 percent.

Yegen soils are similar to Amor, Felor, Lefor, Marmarth, Morton, Reeder, and Vebar soils and commonly are adjacent to Daglum, Felor, Lefor, and Reeder soils on the landscape. Amor, Lefor, Marmarth, Morton, Reeder, and Vebar soils have soft bedrock within a depth of 40 inches. In addition, Amor soils lack an argillic horizon, Morton soils are fine-silty, and Vebar soils lack an argillic horizon and are coarse-loamy. Daglum soils have a natric horizon. They are in swales. Felor soils have a silty clay IIC horizon.

Typical pedon of Yegen loam, in an area of Felor-Yegen loams, 2 to 6 percent slopes, 585 feet north and 2,640 feet west of the southeast corner of sec. 9, T. 18 N., R. 14 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine granular structure; slightly hard, very friable, slightly sticky; slightly acid; abrupt smooth boundary.

B21t—5 to 16 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; faces of peds coated dark grayish brown (10YR 4/2), very dark grayish brown (10YR 3/2) moist; strong medium prismatic structure parting to moderate fine prismatic and moderate medium subangular blocky; hard, friable, sticky and plastic; slightly acid; clear wavy boundary.

B22t—16 to 26 inches; pale brown (10YR 6/3) sandy clay loam, light olive brown (2.5Y 5/4) moist; strong coarse prismatic structure parting to strong medium and coarse blocky; very hard, friable, sticky and plastic; neutral; gradual wavy boundary.

B3ca—26 to 31 inches; pale yellow (2.5Y 7/3) sandy clay loam, light yellowish brown (2.5Y 6/4) moist; moderate very coarse prismatic structure parting to moderate coarse and medium subangular blocky; very hard, friable, sticky and plastic; faces of peds coated with accumulations of carbonates; few threads of carbonates in matrix; strong effervescence; neutral; gradual wavy boundary.

Cca—31 to 51 inches; pale yellow (2.5Y 7/3) light sandy clay loam, light yellowish brown (2.5Y 6/3) moist; common coarse distinct mottles of strong brown (7.5YR 5/6); massive; hard, friable, slightly sticky and slightly plastic; few medium accumulations of carbonates; slight effervescence; mildly alkaline; diffuse wavy boundary.

Cr—51 to 60 inches; pale yellow (2.5Y 7/3) soft bedded sandstone, pale yellow (2.5Y 7/4) moist; few coarse faint mottles of brownish yellow (10YR 6/6); few medium accumulations of carbonates; mildly alkaline.

The thickness of the solum is 20 to 32 inches. Typically, carbonates are at a depth of 15 to more than 40 inches, but they are lacking in some pedons. The depth to soft sandstone typically is 40 to 60 inches but ranges to more than 60 inches. The mollic epipedon is 7 to 16 inches thick.

The A horizon has color value of 4 or 5 (2 or 3 moist) and chroma of 2 or 3. It is loam or sandy loam. It is slightly acid or neutral and is 3 to 6 inches thick. The B2t horizon has hue of 2.5Y or 10YR, value of 4 to 6 (3 to 5 moist), and chroma of 3 or 4. It is sandy clay loam or loam. Some pedons lack carbonates in the B3 and C horizons. The C horizon has hue of 2.5Y or 10YR, value of 5 to 7 (4 to 6 moist), and chroma of 3 to 5. It is light sandy clay loam or sandy loam.

Zeona series

The Zeona series consists of deep, excessively drained, rapidly permeable soils formed in wind-deposited sand. These soils are on terraces and uplands. Slopes range from 2 to 9 percent.

Zeona soils are similar to Banks soils and commonly are adjacent to Absher, Blackhall, Parchin, Trembles, and Twilight soils on the landscape. Absher and Parchin soils have a natric horizon. They generally are below Zeona soils on the landscape. Banks soils have carbonates at or near the surface. They are on bottom land. Blackhall and Twilight soils are less than 40 inches deep over sandstone. They are steeper than Zeona soils and are higher on the landscape. Trembles soils are coarse-loamy. They are on bottom land.

Typical pedon of Zeona loamy fine sand, 2 to 9 percent slopes, 250 feet north and 108 feet east of the southwest corner of sec. 16, T. 14 N., R. 10 E.

A1—0 to 4 inches; grayish brown (2.5Y 5/2) loamy fine sand, very dark grayish brown (2.5Y 3/2) moist; single grained; loose; neutral; clear wavy boundary.

C—4 to 60 inches; light brownish gray (2.5Y 6/2) loamy fine sand, olive gray (2.5Y 4/2) moist; single grained; loose; neutral.

The depth to free carbonates ranges from 36 to more than 60 inches. Reaction ranges from medium acid to mildly alkaline in the upper 36 inches and is neutral to moderately alkaline below. Some pedons have a buried A horizon as a result of recent wind action.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 2 or 3. It is dominantly loamy fine sand, but it is fine sand in some pedons. It is 2 to 5 inches thick. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is loamy fine sand or fine sand.

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965 (*5*). Readers interested in further details about the system should refer to "Soil taxonomy" (*7*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from 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 18, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. 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 Mollisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are 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 Boroll (*Bor*, meaning cool, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Argiborolls (*Argi*, meaning argillic horizons, plus *boroll*, the suborder of Mollisols that have a cool temperature regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Argiborolls.

FAMILY. Families are established within 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, soil 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-silty, mixed Typic Argiborolls.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

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 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) South Dakota Crop and Livestock Reporting Service. 1975. South Dakota agriculture. 94 pp., illus.

(4) 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]

(5) United States Department of Agriculture. 1960. Soil classification, a comprehensive system, 7th approximation. Soil Conserv. Serv., 265 pp., illus. [Supplements issued March 1967, September 1968, April 1969]

(6) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.

(7) 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

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

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, soil. A map unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (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.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Crop residue management. A system of retaining crop residue on land between harvest and replanting to help in controlling erosion and to insure future crop production.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Deferred grazing. A delay in grazing until range plants have reached a specified stage of growth. Grazing is deferred in order to increase the vigor of the forage stand and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

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.

Excess salts. Excess water soluble salts. Excessive salts restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

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.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

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.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range, or geographical distribution.

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.

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.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. Inadequate strength for supporting loads.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. 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.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintains or improves the quantity and quality of desirable vegetation.

Range (or rangeland). Land that, for the most part, produces native plants suitable for grazing by livestock; includes land supporting some forest trees.

Range condition. The health or productivity of forage plants on a given range, in terms of the potential productivity under normal climate and the best practical management. Condition classes generally recognized are—*excellent*, *good*, *fair*, and *poor*. The classification is based on the percentage of original, or assumed climax vegetation on a site, as compared to what has been observed to grow on it when well managed.

Range site. An area of range where climate, soil, and relief are sufficiently uniform to produce a distinct kind and amount of native vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Rooting depth. (In table).Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

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 ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Slick spot. Locally, a small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

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.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

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.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

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 crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use or management.

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.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

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.

Illustrations

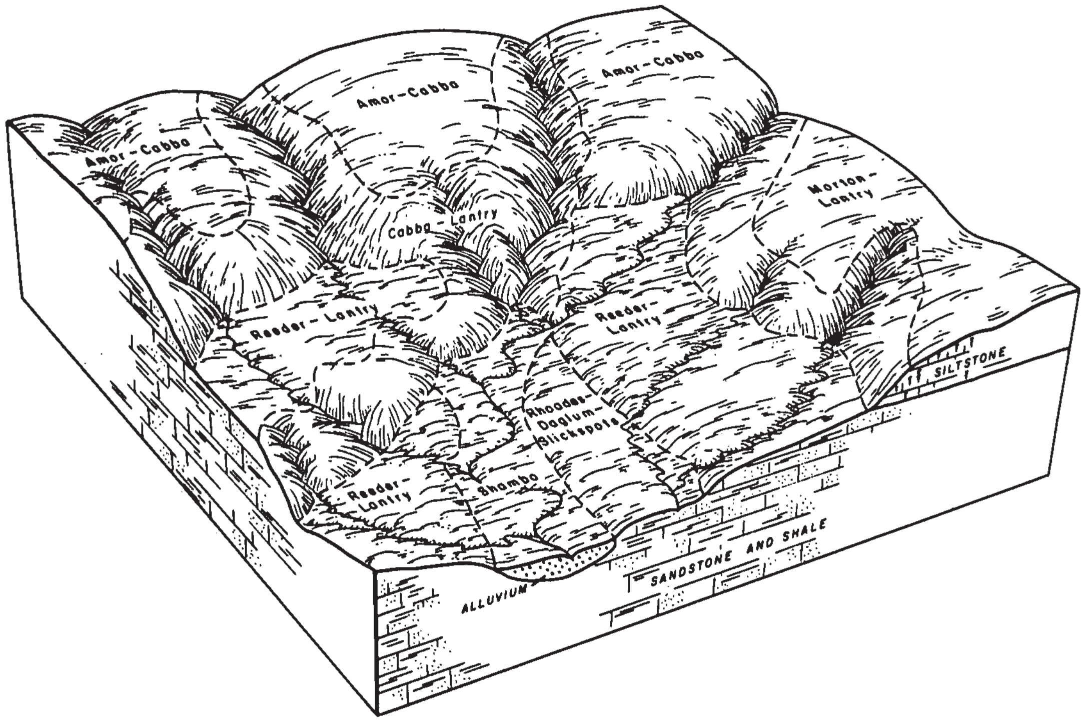


Figure 1.—Pattern of soils and underlying material in the Cabba-Lantry-Amor map unit.

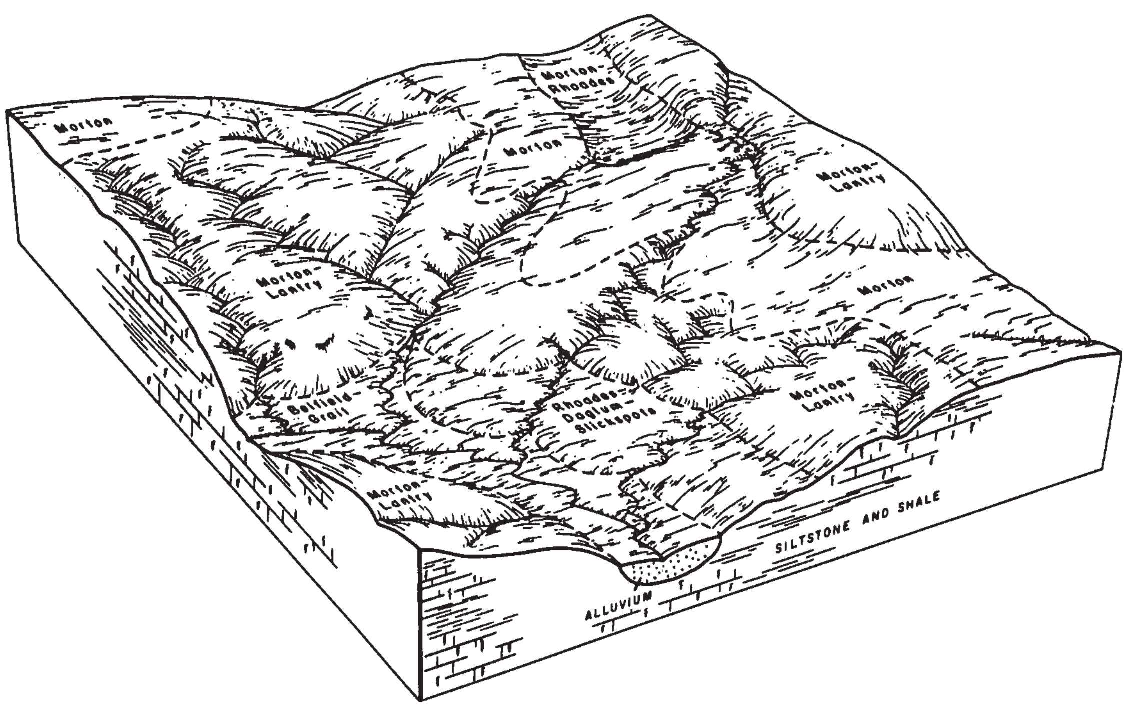


Figure 2.—Pattern of soils and underlying material in the Morton-Lantry map unit.

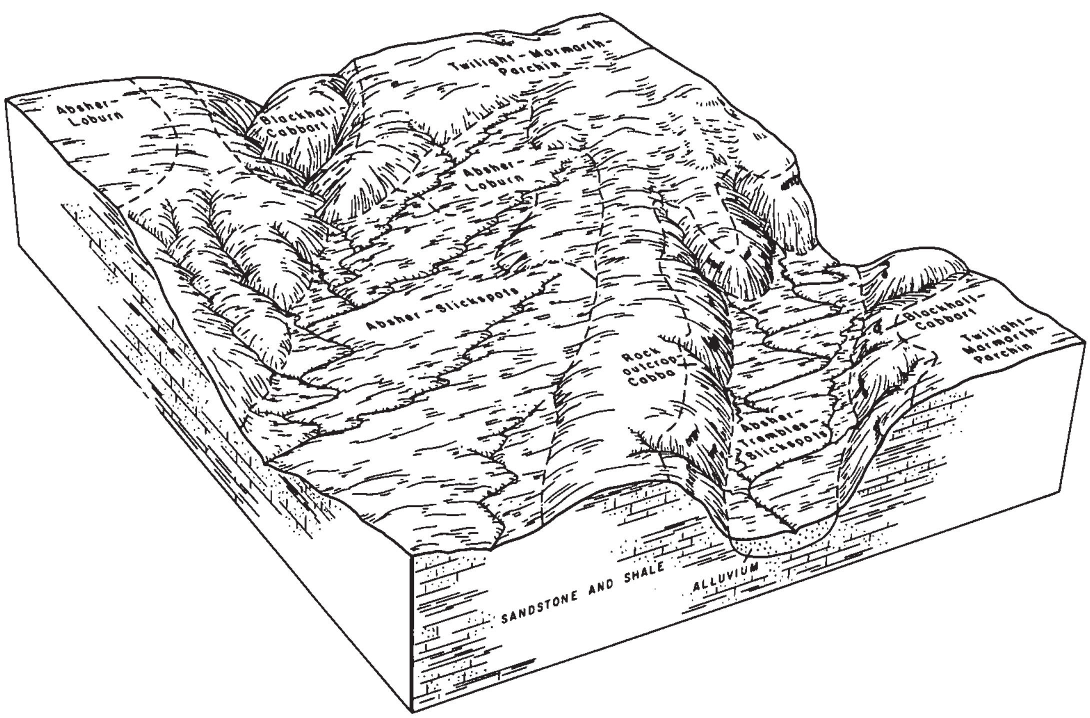


Figure 3.—Pattern of soils and underlying material in the Absher-Twilight map unit.

Figure 4.—An area of Badland.

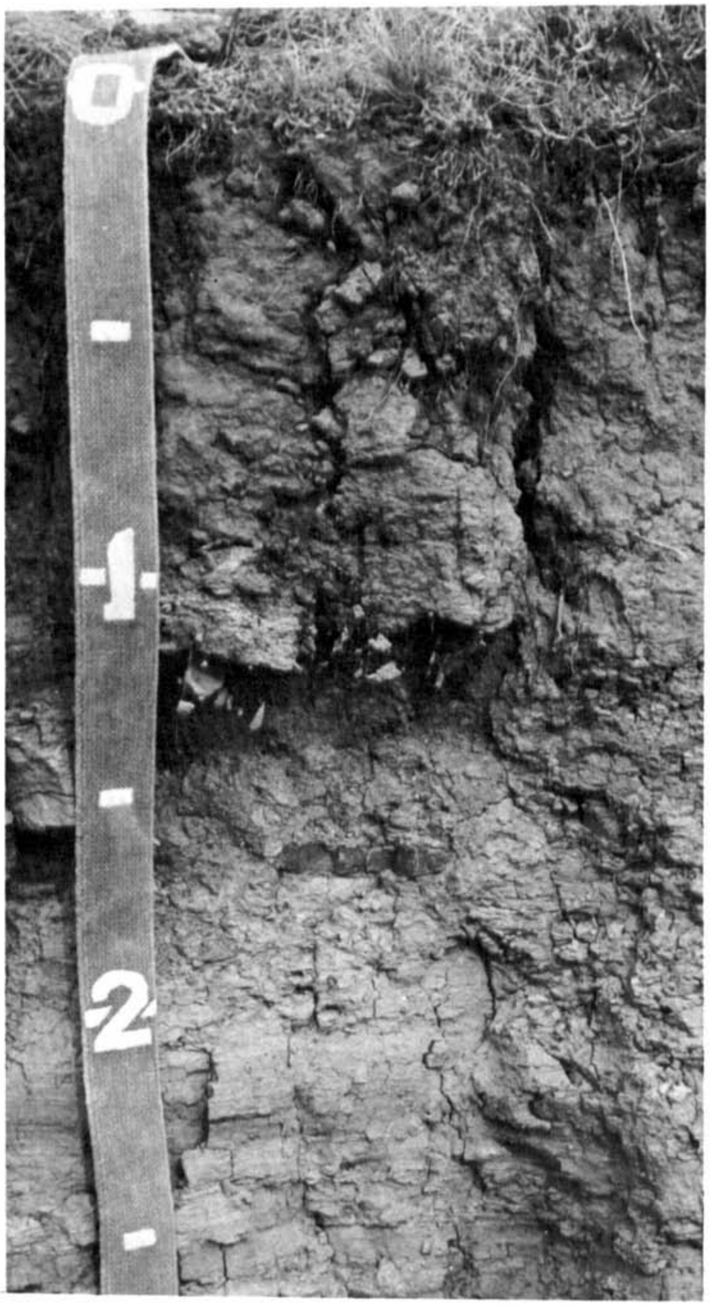


Figure 5.—Profile of Cabba loam, in an area of Cabba-Lantry loams, 15 to 40 percent slopes. Soft siltstone is at a depth of 14 inches.

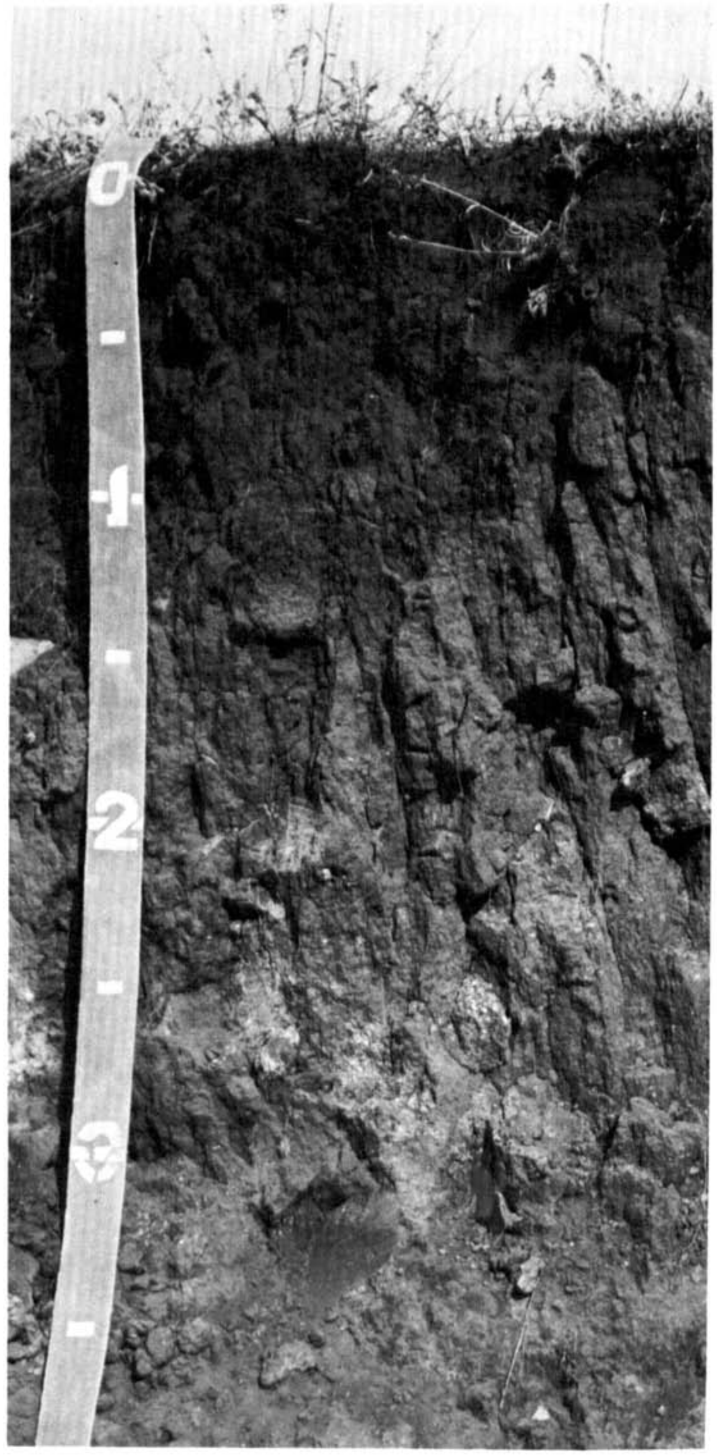


Figure 6.—Profile of Farnuf loam, 0 to 2 percent slopes. The surface layer is about 8 inches thick.

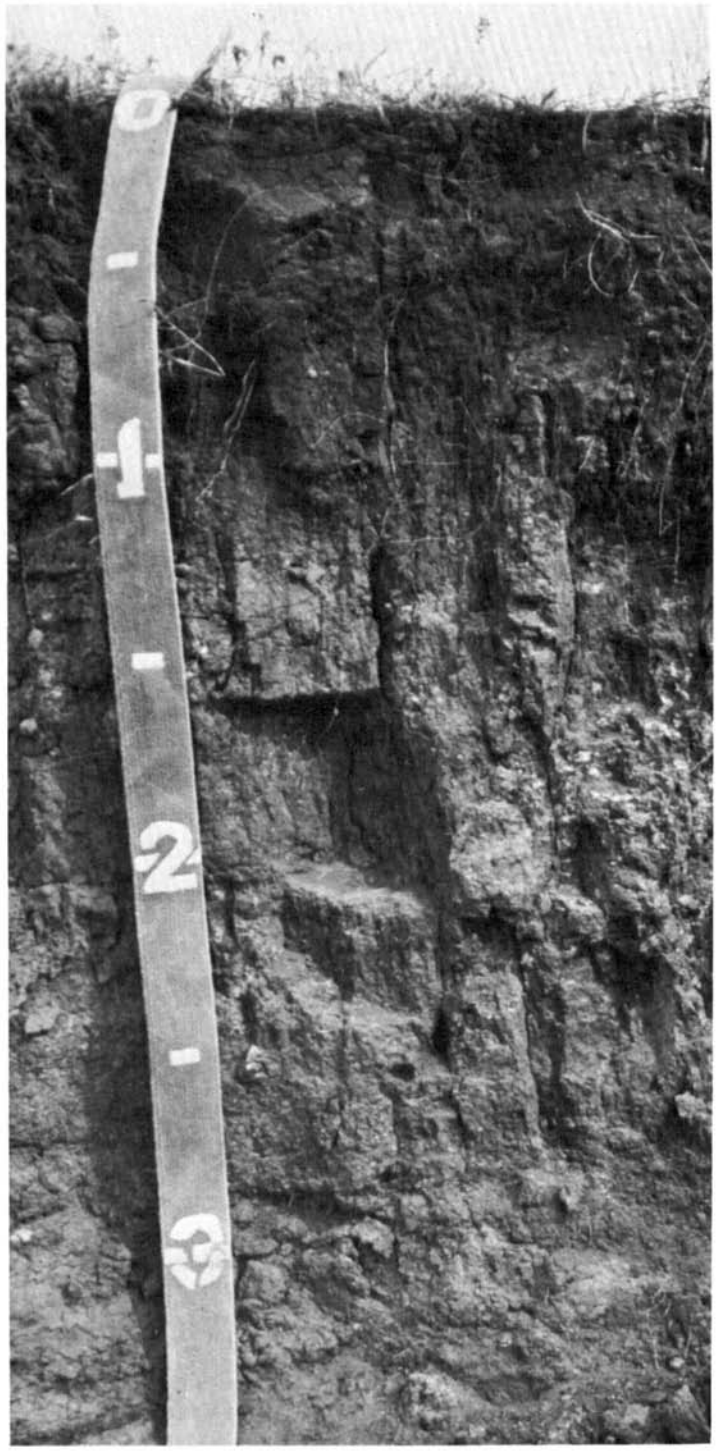


Figure 7.—Profile of Morton loam, 0 to 2 percent slopes. Accumulations of carbonates are at a depth of about 18 inches.

Figure 8.—Tame hayland on Morton loam, 2 to 6 percent slopes.

Figure 9.—An area of Morton-Lantry loams, 2 to 9 percent slopes. The Lantry soil is on the ridges.

Figure 10.—Native hay on Shambo loam.

Figure 11.—Scattered trees on Shambo loam, channeled. The trees provide cover and browse for rangeland wildlife.

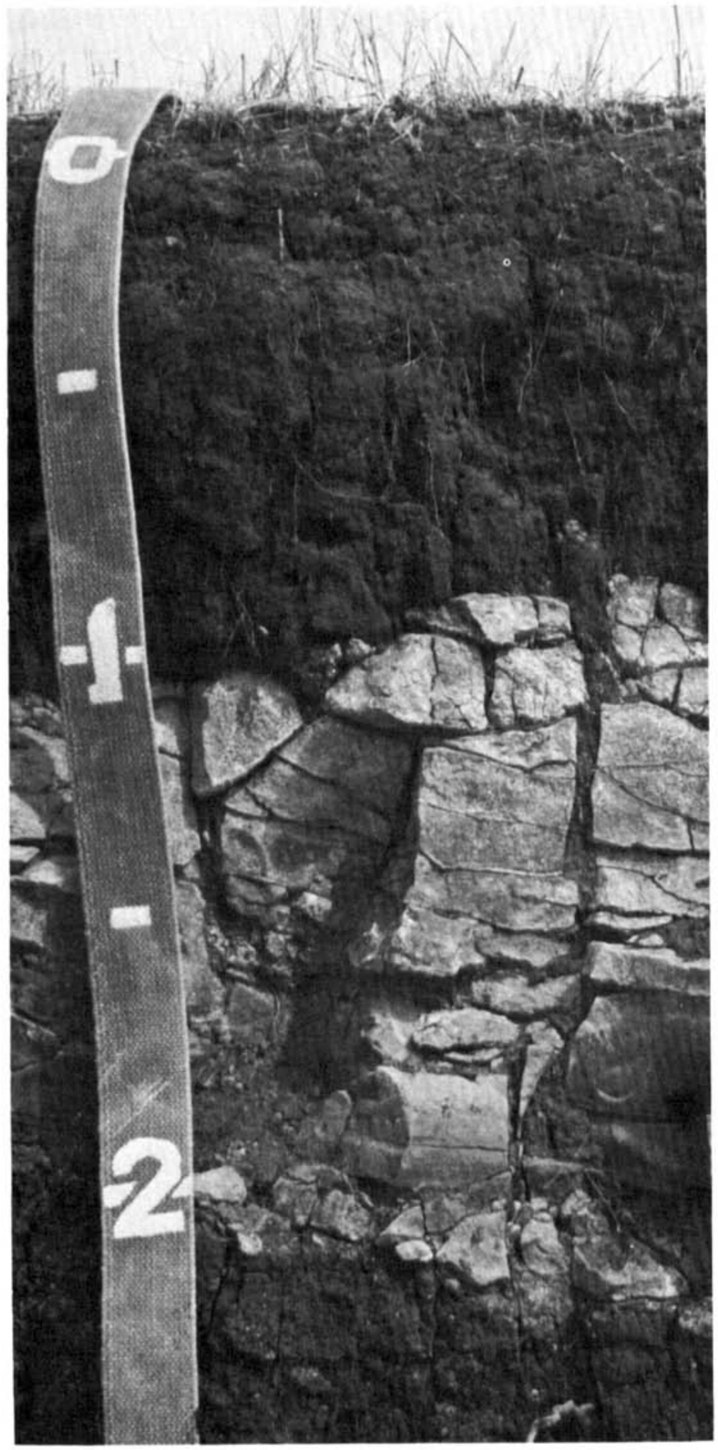


Figure 12.—Profile of Watrous loam, shallow, 0 to 3 percent slopes. Fractured, hard sandstone is at a depth of about 14 inches.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature[1]						Precipitation[1]				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[2]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	26.0	4.0	15.0	57	-25	16	.35	.13	.52	1	5.0
February---	32.2	10.3	21.3	62	-22	13	.45	.12	.70	1	6.0
March------	39.9	18.2	29.0	77	-12	72	.74	.24	1.13	2	6.0
April------	55.6	30.5	43.1	83	9	160	1.87	.71	2.80	4	3.8
May--------	67.4	41.2	54.3	91	25	443	2.93	1.50	4.08	6	.1
June-------	77.3	51.3	64.3	99	36	729	3.38	1.92	4.56	7	.0
July-------	86.2	56.4	71.3	104	42	970	2.21	1.22	3.00	5	.0
August-----	86.1	55.2	70.7	104	39	952	1.72	.64	2.59	4	.0
September--	73.6	43.7	58.7	100	24	561	1.24	.41	1.92	3	.3
October----	61.6	33.9	47.8	87	14	287	.77	.19	1.22	2	.9
November---	42.5	20.5	31.6	70	-4	45	.51	.12	.81	2	3.8
December---	32.5	11.4	22.0	59	-22	35	.39	.06	.63	1	4.5
Year-----	56.7	31.4	44.1	105	-28	4,283	16.56	13.40	19.54	38	30.4

[1]Recorded in the period 1952-74 at Bison, S.Dak.

[2]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature[1]		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 8	May 20	May 31
2 years in 10 later than--	May 2	May 13	May 24
5 years in 10 later than--	April 21	May 2	May 12
First freezing temperature in fall:			
1 year in 10 earlier than--	October 1	September 14	September 6
2 years in 10 earlier than--	October 6	September 20	September 11
5 years in 10 earlier than--	October 17	October 1	September 21

[1]Recorded in the period 1952-74 at Bison, S.Dak.

TABLE 3.--GROWING SEASON LENGTH

Probability	Daily minimum temperature during growing season[1]		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	156	132	114
8 years in 10	163	139	120
5 years in 10	178	152	131
2 years in 10	192	165	142
1 year in 10	199	172	148

[1]Recorded in the period 1952-74 at Bison, S.Dak.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AaB	Absher-Loburn loams, 0 to 9 percent slopes	82,000	4.5
AbC	Absher-Slickspots complex, 0 to 15 percent slopes	101,010	5.5
Ac	Absher-Trembles-Slickspots complex, channeled	16,930	0.9
AdD	Amor-Cabba loams, 6 to 15 percent slopes	106,520	5.8
Ar	Arnegard loam	3,360	0.2
Ba	Badland	6,270	0.3
Bb	Banks loamy fine sand	22,375	1.2
BcA	Belfield-Grail silt loams, 0 to 2 percent slopes	14,670	0.8
BdB	Belfield-Marmarth complex, 0 to 6 percent slopes	6,870	0.4
BeC	Belfield-Morton complex, 2 to 9 percent slopes	11,710	0.6
BfA	Belfield-Rhoades complex, 0 to 2 percent slopes	13,560	0.7
BhE	Blackhall-Cabbart complex, 15 to 40 percent slopes	29,140	1.6
CaE	Cabba-Lantry loams, 15 to 40 percent slopes	108,225	5.9
CbD	Cabba-Trembles complex, 2 to 30 percent slopes	18,355	1.0
CcD	Cabba and Wayden stony soils, 2 to 25 percent slopes	7,610	0.4
CdE	Cohagen-Vebar complex, 15 to 40 percent slopes	6,730	0.4
DaB	Daglum-Felor loams, 2 to 6 percent slopes	2,550	0.1
Db	Dimmick and Heil soils	5,950	0.3
FaA	Farnuf loam, 0 to 2 percent slopes	15,825	0.9
FaB	Farnuf loam, 2 to 6 percent slopes	4,450	0.2
FbA	Farnuf-Daglum loams, 0 to 2 percent slopes	23,000	1.3
FcB	Felor-Yegen loams, 2 to 6 percent slopes	2,720	0.1
FcC	Felor-Yegen loams, 6 to 9 percent slopes	590	*
Fd	Fluvaquents, saline	3,665	0.2
Ga	Grail silt loam	3,725	0.2
LaA	Lawther silty clay, 0 to 2 percent slopes	2,960	0.2
LaB	Lawther silty clay, 2 to 6 percent slopes	5,480	0.3
LaC	Lawther silty clay, 6 to 9 percent slopes	670	*
LbB	Lefor fine sandy loam, 2 to 6 percent slopes	7,285	0.4
MaB	Manning fine sandy loam, 0 to 6 percent slopes	7,620	0.4
MbB	Marmarth loam, 2 to 6 percent slopes	2,910	0.2
McA	Morton loam, 0 to 2 percent slopes	6,270	0.3
McB	Morton loam, 2 to 6 percent slopes	46,970	2.6
McC	Morton loam, 6 to 9 percent slopes	2,300	0.1
MdC	Morton-Lantry loams, 2 to 9 percent slopes	98,999	5.4
MdD	Morton-Lantry loams, 6 to 15 percent slopes	92,755	5.1
MeD	Morton-Rhoades loams, 6 to 15 percent slopes	7,225	0.4
Pa	Parshall fine sandy loam, 0 to 6 percent slopes	11,910	0.6
Pb	Psamments	735	*
RaA	Reeder loam, 0 to 2 percent slopes	4,320	0.2
RaC	Reeder loam, 6 to 9 percent slopes	2,130	0.1
RbB	Reeder-Amor loams, 2 to 6 percent slopes	22,185	1.2
RcC	Reeder-Lantry loams, 2 to 9 percent slopes	128,960	7.0
RdB	Reeder-Rhoades loams, 2 to 6 percent slopes	59,465	3.2
ReB	Regent-Daglum complex, 2 to 6 percent slopes	39,265	2.1
RfB	Regent-Savage silty clay loams, 2 to 6 percent slopes	52,070	2.8
RhD	Regent-Wayden silty clay loams, 6 to 15 percent slopes	11,665	0.6
RkD	Rhoades-Cabba loams, 2 to 25 percent slopes	16,550	0.9
RmC	Rhoades-Daglum-Slickspots complex, 0 to 9 percent slopes	107,596	5.9
RnD	Rhoades-Rock outcrop complex, 6 to 40 percent slopes	32,285	1.8
RoE	Rock outcrop-Cabba complex, 9 to 40 percent slopes	12,660	0.7
SaA	Savage silty clay loam, 0 to 2 percent slopes	10,930	0.6
SbA	Savage-Daglum complex, 0 to 2 percent slopes	15,480	0.8
Sc	Shambo loam	17,675	1.0
Sd	Shambo loam, channeled	31,145	1.7
SeA	Stady loam, 0 to 2 percent slopes	20,580	1.1
Sh	Lohler-Trembles complex	2,535	0.1
Ta	Trembles fine sandy loam	18,610	1.0
Tb	Trembles soils, channeled	18,415	1.0
TcD	Twilight-Marmarth-Parchin association, gently rolling	122,065	6.7
VaC	Vebar-Cohagen complex, 2 to 9 percent slopes	62,700	3.4
VaD	Vebar-Cohagen complex, 6 to 25 percent slopes	62,065	3.4
VbB	Vebar-Tally fine sandy loams, 0 to 6 percent slopes	15,690	0.9
WaD	Wabek sandy loam, 9 to 35 percent slopes	13,110	0.7
WbA	Wabek very gravelly loamy sand, 0 to 2 percent slopes	430	*
WcA	Watrous loam, shallow, 0 to 3 percent slopes	2,350	0.1
YaB	Yegen loam, 2 to 6 percent slopes	2,810	0.2
YaC	Yegen sandy loam, 6 to 9 percent slopes	2,120	0.1
Za	Zeona loamy fine sand, 2 to 9 percent slopes	3,650	0.2
	Water areas	10,830	0.6
	Total	1,834,240	100.0

* Less than 0.1 percent.

TABLE 5.--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	Spring wheat	Winter wheat	Alfalfa hay	Cool season grass
	Bu	Bu	Bu	Bu	Ton	AUM*
AaB**: Absher-Loburn	---	---	---	---	---	---
AbC**: Absher-Slickspots	---	---	---	---	---	---
Ac**: Absher-Trembles-Slickspots	---	---	---	---	---	---
AdD**: Amor-Cabba	---	32	16	20	0.8	1.5
Ar: Arnegard	42	65	35	40	2.5	4.2
Ba**: Badland	---	---	---	---	---	---
Bb: Banks	---	---	---	---	---	---
BcA**: Belfield-Grail	30	55	26	30	1.9	3.2
BdB**: Belfield-Marmarth	23	43	20	24	1.3	2.1
BeC**: Belfield-Morton	---	42	22	25	1.4	2.3
BfA**: Belfield-Rhoades	---	35	18	20	1.2	2.0
BhE**: Blackhall-Cabbart	---	---	---	---	---	---
CaE**: Cabba-Lantry	---	---	---	---	---	---
CbD**: Cabba-Trembles	---	---	---	---	---	---
CcD**: Cabba and Wayden	---	---	---	---	---	---
CdE**: Cohagen-Vebar	---	---	---	---	---	---
DaB**: Daglum-Felor	22	36	20	25	1.1	1.8
Db**: Dimmick and Heil	---	---	---	---	---	---
FaA: Farnuf	34	55	28	33	1.7	2.8
FaB: Farnuf	32	53	26	30	1.5	2.5
FbA**: Farnuf-Daglum	29	45	24	30	1.5	2.4
FcB**: Felor-Yegen	32	49	26	---	1.6	2.6

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Spring wheat	Winter wheat	Alfalfa hay	Cool season grass
	Bu	Bu	Bu	Bu	Ton	AUM*
FcC**: Felor-Yegen	---	46	22	---	1.5	2.4
Fd: Fluvaquents	---	---	---	---	---	---
Ga: Grail	40	64	31	37	2.5	4.2
LaA: Lawther	28	55	28	32	1.9	3.2
LaB: Lawther	25	53	25	28	1.7	2.8
LaC: Lawther	---	42	19	---	1.5	2.4
LbB: Lefor	28	38	20	25	1.2	2.0
MaB: Manning	22	39	20	26	1.2	2.0
MbB: Marmarth	---	39	22	28	1.3	2.2
McA: Morton	34	53	28	32	1.7	2.8
McB: Morton	32	51	26	30	1.7	2.8
McC: Morton	---	43	22	26	1.5	2.4
MdC**: Morton-Lantry	26	45	24	27	1.6	2.7
MdD**: Morton-Lantry	---	30	16	20	1.2	2.0
MeD**: Morton-Rhoades	---	27	17	---	1.1	1.8
Pa: Parshall	38	45	24	---	1.9	3.2
Pb: Psamments	---	---	---	---	---	---
RaA: Reeder	34	53	28	32	1.7	2.8
RaC: Reeder	---	44	22	26	1.5	2.5
RbB**: Reeder-Amor	32	51	25	29	1.5	2.5
RcC**: Reeder-Lantry	26	45	22	26	1.6	2.7
RdB**: Reeder-Rhoades	---	37	19	---	1.3	2.2
ReB**: Regent-Daglum	23	39	22	26	1.2	2.0
RfB**: Regent-Savage	30	51	26	30	1.6	2.7

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Spring wheat	Winter wheat	Alfalfa hay	Cool season grass
	Bu	Bu	Bu	Bu	Ton	AUM*
RhD**: Regent-Wayden	---	31	18	21	1.1	1.8
RkD**: Rhoades-Cabba	---	---	---	---	---	---
RmC**: Rhoades-Daglum-Slickspots	---	---	---	---	---	---
RnD**: Rhoades-Rock outcrop	---	---	---	---	---	---
RoE**: Rock outcrop-Cabba	---	---	---	---	---	---
SaA: Savage	32	51	28	32	1.9	3.2
SbA**: Savage-Daglum	27	45	25	26	1.5	2.5
Sc: Shambo	34	55	28	32	1.7	2.8
Sd: Shambo	---	---	---	---	2.0	3.2
SeA: Stady	---	40	21	---	1.0	1.7
Sh**: Lohler-Trembles	30	50	25	---	1.8	3.0
Ta: Trembles	33	48	24	---	1.5	2.5
Tb: Trembles	---	---	---	---	2.0	3.2
TcD**:						
Twilight	---	---	---	---	---	---
Marmarth	---	35	18	---	1.1	1.8
Parchin	---	26	15	---	0.5	0.8
VaC**: Vebar-Cohagen	---	34	19	---	1.1	1.8
VaD**: Vebar-Cohagen	---	---	---	---	---	---
VbB**: Vebar-Tally	30	41	24	---	1.3	2.2
WaD, WbA: Wabek	---	---	---	---	---	---
WcA: Watrous	---	37	18	---	1.0	1.7
YaB: Yegen	30	48	25	29	1.3	2.4
YaC: Yegen	---	42	20	---	1.0	1.7
Za: Zeona	---	---	---	---	---	---

* 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.

** See map unit description for the composition and behavior of the map unit.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Soils not listed do not support rangeland vegetation suited to grazing]

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
AaB*:					
Absher	Thin Claypan	Favorable	960	Blue grama	40
		Normal	800	Western wheatgrass	20
		Unfavorable	480	Buffalograss	10
				Needleandthread	5
				Inland saltgrass	5
Loburn	Claypan	Favorable	1,440	Western wheatgrass	40
		Normal	1,200	Needleandthread	15
		Unfavorable	840	Blue grama	15
				Green needlegrass	10
				Sedge	10
				Buffalograss	5
AbC*:					
Absher	Thin Claypan	Favorable	960	Blue grama	40
		Normal	800	Western wheatgrass	20
		Unfavorable	480	Buffalograss	10
				Needleandthread	5
				Inland saltgrass	5
Slickspots.					
Ac*:					
Absher	Thin Claypan	Favorable	960	Blue grama	40
		Normal	800	Western wheatgrass	20
		Unfavorable	480	Buffalograss	10
				Needleandthread	5
				Inland saltgrass	5
Trembles	Overflow	Favorable	3,360	Western wheatgrass	25
		Normal	2,800	Big bluestem	25
		Unfavorable	1,960	Prairie sandreed	15
				Green needlegrass	15
				Sideoats grama	5
Slickspots.					
AdD*:					
Amor	Silty	Favorable	2,520	Western wheatgrass	50
		Normal	2,100	Needleandthread	15
		Unfavorable	1,470	Green needlegrass	15
				Blue grama	10
Cabba	Shallow	Favorable	1,920	Little bluestem	35
		Normal	1,600	Sideoats grama	15
		Unfavorable	1,120	Western wheatgrass	10
				Needleandthread	10
				Green needlegrass	10
Ar Arnegard	Overflow	Favorable	3,960	Big bluestem	30
		Normal	3,300	Western wheatgrass	20
		Unfavorable	2,310	Green needlegrass	15
				Needleandthread	5
				Kentucky bluegrass	5
				Sedge	5
Bb Banks	Sands	Favorable	2,880	Big bluestem	20
		Normal	2,400	Needleandthread	15
		Unfavorable	1,680	Blue grama	10
				Western wheatgrass	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
BcA*:					
Belfield	Clayey	Favorable	2,760	Western wheatgrass	50
		Normal	2,300	Green needlegrass	25
		Unfavorable	1,610	Blue grama	5
Grail	Overflow	Favorable	4,320	Big bluestem	25
		Normal	3,600	Western wheatgrass	25
		Unfavorable	2,520	Green needlegrass	15
				Sedge	10
				Needleandthread	5
BdB*:					
Belfield	Clayey	Favorable	2,760	Western wheatgrass	50
		Normal	2,300	Green needlegrass	25
		Unfavorable	1,610	Blue grama	5
Marmarth	Silty	Favorable	2,160	Western wheatgrass	35
		Normal	1,800	Needleandthread	15
		Unfavorable	1,260	Green needlegrass	15
				Blue grama	15
BeC*:					
Belfield	Clayey	Favorable	2,520	Western wheatgrass	45
		Normal	2,100	Green needlegrass	25
		Unfavorable	1,470	Blue grama	10
Morton	Silty	Favorable	2,760	Western wheatgrass	40
		Normal	2,300	Green needlegrass	20
		Unfavorable	1,610	Needleandthread	10
				Blue grama	10
BfA*:					
Belfield	Clayey	Favorable	2,760	Western wheatgrass	50
		Normal	2,300	Green needlegrass	25
		Unfavorable	1,610	Blue grama	5
Rhoades	Thin Claypan	Favorable	1,200	Blue grama	35
		Normal	1,000	Western wheatgrass	25
		Unfavorable	600	Buffalograss	15
				Needleleaf sedge	5
				Broom snakeweed	5
BhE*:					
Blackhall	Shallow	Favorable	1,680	Little bluestem	40
		Normal	1,400	Needleandthread	15
		Unfavorable	980	Sideoats grama	10
				Sedge	10
				Western wheatgrass	5
Cabbart	Shallow	Favorable	1,560	Little bluestem	40
		Normal	1,300	Sideoats grama	15
		Unfavorable	910	Needleandthread	10
				Blue grama	10
				Western wheatgrass	5
CaE*:					
Cabba	Shallow	Favorable	1,680	Little bluestem	35
		Normal	1,400	Sideoats grama	15
		Unfavorable	980	Western wheatgrass	10
				Needleandthread	10
				Green needlegrass	10
Lantry	Thin Upland	Favorable	1,920	Little bluestem	25
		Normal	1,600	Needleandthread	20
		Unfavorable	1,120	Sideoats grama	20
				Western wheatgrass	10
				Blue grama	10
				Sedge	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
CbD*:					
Cabba	Shallow	Favorable	1,680	Little bluestem	35
		Normal	1,400	Sideoats grama	15
		Unfavorable	980	Western wheatgrass	10
				Needleandthread	10
				Green needlegrass	10
Trembles	Overflow	Favorable	3,360	Western wheatgrass	25
		Normal	2,800	Big bluestem	25
		Unfavorable	1,960	Prairie sandreed	15
				Green needlegrass	15
				Sideoats grama	5
CcD*:					
Cabba	Shallow	Favorable	1,560	Little bluestem	25
		Normal	1,300	Needleandthread	10
		Unfavorable	910	Prairie sandreed	10
				Western wheatgrass	5
				Blue grama	5
Wayden	Shallow	Favorable	1,560	Little bluestem	35
		Normal	1,300	Sideoats grama	15
		Unfavorable	910	Needleandthread	10
				Western wheatgrass	10
				Blue grama	10
CdE*:					
Cohagen	Shallow	Favorable	1,800	Little bluestem	30
		Normal	1,500	Needleandthread	10
		Unfavorable	1,050	Prairie sandreed	10
				Blue grama	10
				Sideoats grama	10
				Western wheatgrass	5
				Threadleaf sedge	5
Vebar	Sandy	Favorable	2,400	Prairie sandreed	20
		Normal	2,000	Needleandthread	10
		Unfavorable	1,400	Western wheatgrass	10
				Blue grama	10
DaB*:					
Daglum	Claypan	Favorable	1,680	Western wheatgrass	40
		Normal	1,400	Blue grama	20
		Unfavorable	980	Needleandthread	15
				Green needlegrass	5
Felor	Silty	Favorable	2,400	Western wheatgrass	30
		Normal	2,000	Green needlegrass	25
		Unfavorable	1,400	Needleandthread	25
				Blue grama	10
				Sedge	5
Db*:					
Dimmick	Wetland	Favorable	3,600	Rivergrass	30
		Normal	3,000	Slough sedge	25
		Unfavorable	2,100	Prairie cordgrass	10
				Reed canarygrass	5
Heil	Closed Depression	Favorable	2,640	Western wheatgrass	75
		Normal	2,400		
		Unfavorable	1,680		
FaA, FaB Farnuf	Silty	Favorable	2,520	Western wheatgrass	30
		Normal	2,100	Needleandthread	20
		Unfavorable	1,470	Green needlegrass	15
				Blue grama	10
				Little bluestem	5
				Prairie sandreed	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
FbA*:					
Farnuf	Silty	Favorable	2,520	Western wheatgrass	30
		Normal	2,100	Needleandthread	20
		Unfavorable	1,470	Green needlegrass	15
				Blue grama	10
				Little bluestem	5
				Prairie sandreed	5
Daglum	Claypan	Favorable	1,680	Western wheatgrass	40
		Normal	1,400	Blue grama	20
		Unfavorable	980	Needleandthread	15
				Green needlegrass	5
FcB*, FcC*:					
Felor	Silty	Favorable	2,400	Western wheatgrass	30
		Normal	2,000	Green needlegrass	25
		Unfavorable	1,400	Needleandthread	25
				Blue grama	10
				Sedge	5
Yegen	Silty	Favorable	2,400	Western wheatgrass	40
		Normal	2,000	Green needlegrass	25
		Unfavorable	1,400	Blue grama	15
				Needleandthread	10
				Sedge	5
Fd Fluvaquents, saline	Saline Lowland	Favorable	3,300	Cordgrass	50
		Normal	3,000	Nuttall alkaligrass	20
		Unfavorable	2,400	Western wheatgrass	10
				Inland saltgrass	10
Ga Grail	Overflow	Favorable	4,320	Big bluestem	25
		Normal	3,600	Western wheatgrass	25
		Unfavorable	2,520	Green needlegrass	15
				Sedge	10
				Needleandthread	5
LaA, LaB Lawther	Clayey	Favorable	2,400	Western wheatgrass	45
		Normal	2,000	Green needlegrass	25
		Unfavorable	1,400	Blue grama	5
				Needleleaf sedge	5
LaC Lawther	Clayey	Favorable	2,400	Western wheatgrass	45
		Normal	2,000	Green needlegrass	25
		Unfavorable	1,400	Blue grama	5
				Needleleaf sedge	5
LbB Lefor	Sandy	Favorable	2,520	Prairie sandreed	20
		Normal	2,100	Needleandthread	15
		Unfavorable	1,470	Western wheatgrass	10
				Blue grama	10
MaB Manning	Sandy	Favorable	2,520	Needleandthread	20
		Normal	2,100	Prairie sandreed	20
		Unfavorable	1,470	Blue grama	10
				Western wheatgrass	10
MbB Marmarth	Silty	Favorable	2,160	Western wheatgrass	35
		Normal	1,800	Needleandthread	15
		Unfavorable	1,260	Green needlegrass	15
				Blue grama	15
McA, McB, McC Morton	Silty	Favorable	2,760	Western wheatgrass	40
		Normal	2,300	Green needlegrass	20
		Unfavorable	1,610	Needleandthread	10
				Blue grama	10
MdC*:					
Morton	Silty	Favorable	2,520	Western wheatgrass	40
		Normal	2,100	Green needlegrass	20
		Unfavorable	1,470	Needleandthread	10
				Blue grama	10

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
MdC*:					
Lantry	Thin Upland	Favorable	2,160	Little bluestem	25
		Normal	1,800	Needleandthread	20
		Unfavorable	1,260	Sideoats grama	20
				Western wheatgrass	10
				Sedge	10
				Blue grama	5
MdD*:					
Morton	Silty	Favorable	2,520	Western wheatgrass	40
		Normal	2,100	Green needlegrass	20
		Unfavorable	1,470	Needleandthread	10
				Blue grama	10
Lantry	Thin Upland	Favorable	2,160	Little bluestem	25
		Normal	1,800	Needleandthread	20
		Unfavorable	1,260	Sideoats grama	20
				Western wheatgrass	10
				Blue grama	10
				Sedge	5
MeD*:					
Morton	Silty	Favorable	2,520	Western wheatgrass	40
		Normal	2,100	Green needlegrass	20
		Unfavorable	1,470	Needleandthread	10
				Blue grama	10
Rhoades	Thin Claypan	Favorable	1,200	Blue grama	35
		Normal	1,000	Western wheatgrass	25
		Unfavorable	600	Buffalograss	15
				Needleleaf sedge	5
				Broom snakeweed	5
Pa Parshall	Sandy	Favorable	2,760	Prairie sandreed	20
		Normal	2,300	Needleandthread	15
		Unfavorable	1,610	Western wheatgrass	10
				Leadplant	10
				Blue grama	5
				Green sagewort	5
RaA, RaC Reeder	Silty	Favorable	2,520	Western wheatgrass	30
		Normal	2,100	Needleandthread	20
		Unfavorable	1,470	Green needlegrass	15
				Blue grama	10
RbB*:					
Reeder	Silty	Favorable	2,520	Western wheatgrass	30
		Normal	2,100	Needleandthread	20
		Unfavorable	1,470	Green needlegrass	15
				Blue grama	10
Amor	Silty	Favorable	2,520	Western wheatgrass	50
		Normal	2,100	Needleandthread	15
		Unfavorable	1,470	Green needlegrass	15
				Blue grama	10
RcC*:					
Reeder	Silty	Favorable	2,520	Western wheatgrass	30
		Normal	2,100	Needleandthread	20
		Unfavorable	1,470	Green needlegrass	15
				Blue grama	10
Lantry	Thin Upland	Favorable	2,160	Little bluestem	25
		Normal	1,800	Needleandthread	20
		Unfavorable	1,260	Sideoats grama	20
				Western wheatgrass	10
				Sedge	10
				Blue grama	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
RdB*:					
Reeder	Silty	Favorable	2,520	Western wheatgrass	30
		Normal	2,100	Needleandthread	20
		Unfavorable	1,470	Green needlegrass	15
				Blue grama	10
Rhoades	Thin Claypan	Favorable	1,200	Blue grama	35
		Normal	1,000	Western wheatgrass	25
		Unfavorable	600	Buffalograss	15
				Needleleaf sedge	5
				Broom snakeweed	5
ReB*:					
Regent	Clayey	Favorable	2,400	Western wheatgrass	45
		Normal	2,000	Green needlegrass	25
		Unfavorable	1,400	Blue grama	5
				Needleleaf sedge	5
Daglum	Claypan	Favorable	1,680	Western wheatgrass	40
		Normal	1,400	Blue grama	20
		Unfavorable	980	Needleandthread	15
				Green needlegrass	5
RfB*:					
Regent	Clayey	Favorable	2,400	Western wheatgrass	45
		Normal	2,000	Green needlegrass	25
		Unfavorable	1,400	Blue grama	5
				Needleleaf sedge	5
Savage	Clayey	Favorable	2,400	Western wheatgrass	45
		Normal	2,000	Green needlegrass	25
		Unfavorable	1,400	Blue grama	15
RhD*:					
Regent	Clayey	Favorable	2,400	Western wheatgrass	45
		Normal	2,000	Green needlegrass	25
		Unfavorable	1,400	Blue grama	5
				Needleleaf sedge	5
Wayden	Shallow	Favorable	1,920	Little bluestem	35
		Normal	1,600	Sideoats grama	15
		Unfavorable	1,120	Needleandthread	10
				Western wheatgrass	10
				Blue grama	10
RkD*:					
Rhoades	Thin Claypan	Favorable	1,200	Blue grama	35
		Normal	1,000	Western wheatgrass	25
		Unfavorable	600	Buffalograss	15
				Needleleaf sedge	5
				Broom snakeweed	5
Cabba	Shallow	Favorable	1,920	Little bluestem	35
		Normal	1,600	Sideoats grama	15
		Unfavorable	1,120	Western wheatgrass	10
				Needleandthread	10
				Green needlegrass	10
RmC*:					
Rhoades	Thin Claypan	Favorable	1,200	Blue grama	35
		Normal	1,000	Western wheatgrass	25
		Unfavorable	600	Buffalograss	15
				Needleleaf sedge	5
				Broom snakeweed	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
RmC*:					
Daglum	Claypan	Favorable	1,680	Western wheatgrass	40
		Normal	1,400	Blue grama	20
		Unfavorable	980	Needleandthread	15
				Green needlegrass	5
Slickspots.					
RnD*:					
Rhoades	Thin Claypan	Favorable	1,200	Blue grama	35
		Normal	1,000	Western wheatgrass	25
		Unfavorable	600	Buffalograss	15
				Needleleaf sedge	5
				Broom snakeweed	5
Rock outcrop.					
RoE*:					
Rock outcrop.					
Cabba	Shallow	Favorable	1,680	Little bluestem	35
		Normal	1,400	Sideoats grama	15
		Unfavorable	980	Western wheatgrass	10
				Needleandthread	10
				Green needlegrass	10
SaA Savage	Clayey	Favorable	2,400	Western wheatgrass	45
		Normal	2,000	Green needlegrass	25
		Unfavorable	1,400	Blue grama	15
SbA*:					
Savage	Clayey	Favorable	2,400	Western wheatgrass	45
		Normal	2,000	Green needlegrass	25
		Unfavorable	1,400	Blue grama	15
Daglum	Claypan	Favorable	1,680	Western wheatgrass	40
		Normal	1,400	Blue grama	20
		Unfavorable	980	Needleandthread	15
				Green needlegrass	5
Sc Shambo	Silty	Favorable	2,520	Western wheatgrass	50
		Normal	2,100	Needleandthread	15
		Unfavorable	1,470	Green needlegrass	15
				Blue grama	10
Sd Shambo	Overflow	Favorable	3,600	Big bluestem	50
		Normal	3,000	Green needlegrass	15
		Unfavorable	2,100	Western wheatgrass	15
				Sideoats grama	5
				Leadplant	5
				Sedge	5
SeA Stady	Silty	Favorable	2,520	Western wheatgrass	50
		Normal	2,100	Needleandthread	15
		Unfavorable	1,400	Green needlegrass	15
				Blue grama	10
Sh*:					
Lohler	Overflow	Favorable	3,300	Western wheatgrass	35
		Normal	3,000	Big bluestem	20
		Unfavorable	2,100	Green needlegrass	10
				Switchgrass	10
				Prairie sandreed	10
				Sedge	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
Sh*:					
Trembles	Overflow	Favorable	3,360	Western wheatgrass	25
		Normal	2,800	Big bluestem	25
		Unfavorable	1,960	Prairie sandreed	15
				Green needlegrass	15
				Sideoats grama	5
Ta, Tb Trembles	Overflow	Favorable	3,360	Western wheatgrass	25
		Normal	2,800	Big bluestem	25
		Unfavorable	1,960	Prairie sandreed	15
				Green needlegrass	15
				Sideoats grama	5
TcD*:					
Twilight	Sandy	Favorable	2,280	Prairie sandreed	20
		Normal	1,900	Little bluestem	20
		Unfavorable	1,330	Sand bluestem	10
				Needleandthread	10
				Western wheatgrass	10
				Blue grama	10
				Sedge	10
				Fringed sagebrush	5
Marmarth	Silty	Favorable	2,160	Western wheatgrass	35
		Normal	1,800	Needleandthread	15
		Unfavorable	1,260	Green needlegrass	15
				Blue grama	15
Parchin	Claypan	Favorable	1,560	Western wheatgrass	30
		Normal	1,300	Needleandthread	20
		Unfavorable	910	Green needlegrass	15
				Blue grama	15
				Sedge	10
				Buffalograss	5
VaC*, VaD*:					
Vebar	Sandy	Favorable	2,520	Prairie sandreed	20
		Normal	2,100	Needleandthread	10
		Unfavorable	1,470	Western wheatgrass	10
				Blue grama	10
Cohagen	Shallow	Favorable	1,920	Little bluestem	30
		Normal	1,600	Needleandthread	10
		Unfavorable	1,120	Prairie sandreed	10
				Blue grama	10
				Sideoats grama	10
				Western wheatgrass	5
				Threadleaf sedge	5
VbB*:					
Vebar	Sandy	Favorable	2,760	Prairie sandreed	20
		Normal	2,300	Needleandthread	10
		Unfavorable	1,610	Western wheatgrass	10
				Blue grama	10
Tally	Sandy	Favorable	2,520	Little bluestem	25
		Normal	2,100	Needleandthread	15
		Unfavorable	1,470	Prairie sandreed	15
				Blue grama	15
				Sideoats grama	10
				Western wheatgrass	5
WaD, WbA Wabek	Very Shallow	Favorable	960	Blue grama	30
		Normal	800	Needleandthread	25
		Unfavorable	480	Threadleaf sedge	20

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
WcA----------------- Watrous	Silty-------------------------	Favorable	2,050	Western wheatgrass-------------	25
		Normal	1,700	Needleandthread----------------	15
		Unfavorable	1,350	Blue grama---------------------	15
				Green needlegrass--------------	7
				Prairie junegrass--------------	5
				Kentucky bluegrass-------------	5
YaB----------------- Yegen	Silty-------------------------	Favorable	2,400	Western wheatgrass-------------	40
		Normal	2,000	Green needlegrass--------------	25
		Unfavorable	1,400	Blue grama---------------------	15
				Needleandthread----------------	10
				Sedge--------------------------	5
YaC----------------- Yegen	Sandy-------------------------	Favorable	2,520	Little bluestem----------------	25
		Normal	2,100	Prairie sandreed---------------	20
		Unfavorable	1,470	Western wheatgrass-------------	15
				Needleandthread----------------	15
				Blue grama---------------------	10
				Green needlegrass--------------	5
				Sedge--------------------------	5
Za------------------ Zeona	Sands-------------------------	Favorable	2,280	Prairie sandreed---------------	40
		Normal	1,900	Little bluestem----------------	20
		Unfavorable	1,300	Sand bluestem------------------	10
				Needleandthread----------------	10
				Sand dropseed------------------	5
				Blue grama---------------------	5
				Sedge--------------------------	5

* See map unit description for the composition and behavior of the map unit.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; the symbol > means greater than. 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, in feet, of--			
	<8	8-15	16-25	26-35
AaB*:				
Absher.				
Loburn.				
AbC*:				
Absher.				
Slickspots.				
Ac*:				
Absher.				
Trembles	Lilac	Russian-olive, Rocky Mt. juniper, Siberian peashrub, American plum.	Ponderosa pine, blue spruce, Black Hills spruce, green ash, common hackberry.	Plains cottonwood, golden willow.
Slickspots.				
AdD*:				
Amor	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Cabba.				
Ar Arnegard	Lilac	Russian-olive, Rocky Mt. juniper, Siberian peashrub, American plum.	Ponderosa pine, blue spruce, Black Hills spruce, green ash, common hackberry.	Plains cottonwood, golden willow.
Ba*. Badland				
Bb Banks	---	Rocky Mt. juniper, eastern redcedar.	Ponderosa pine	Plains cottonwood.
BcA*:				
Belfield	Siberian peashrub, silver buffaloberry, American plum, Peking cotoneaster, lilac.	Green ash, Rocky Mt. juniper, Russian-olive, Siberian crabapple, common chokecherry.	Siberian elm, ponderosa pine.	---
Grail	Lilac	Russian-olive, Rocky Mt. juniper, Siberian peashrub, American plum.	Ponderosa pine, blue spruce, Black Hills spruce, green ash, common hackberry.	Plains cottonwood, golden willow.

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35
BdB*:				
Belfield	Siberian peashrub, silver buffaloberry, American plum, Peking cotoneaster, lilac.	Green ash, Rocky Mt. juniper, Russian-olive, Siberian crabapple, common chokecherry.	Siberian elm, ponderosa pine.	---
Marmarth	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
BeC*:				
Belfield	Siberian peashrub, silver buffaloberry, American plum, Peking cotoneaster, lilac.	Green ash, Rocky Mt. juniper, Russian-olive, Siberian crabapple, common chokecherry.	Siberian elm, ponderosa pine.	---
Morton	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
BfA*:				
Belfield	Siberian peashrub, silver buffaloberry, American plum, Peking cotoneaster, lilac.	Green ash, Rocky Mt. juniper, Russian-olive, Siberian crabapple, common chokecherry.	Siberian elm, ponderosa pine.	---
Rhoades.				
BhE*:				
Blackhall.				
Cabbart.				
CaE*:				
Cabba.				
Lantry.				
CbD*:				
Cabba.				
Trembles	Lilac	Russian-olive, Rocky Mt. juniper, Siberian peashrub, American plum.	Ponderosa pine, blue spruce, Black Hills spruce, green ash, common hackberry.	Plains cottonwood, golden willow.

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--			
	<8	8-15	16-25	26-35
CcD*:				
Cabba.				
Wayden.				
CdE*:				
Cohagen.				
Vebar.				
DaB*:				
Daglum	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---
Felor	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Db*:				
Dimmick.				
Heil.				
FaA, FaB Farnuf	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
FbA*:				
Farnuf	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Daglum	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35
FcB*, FcC*: Felor	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Yegen	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Fd. Fluvaquents, saline				
Ga Grail	Lilac	Russian-olive, Rocky Mt. juniper, Siberian peashrub, American plum.	Ponderosa pine, blue spruce, Black Hills spruce, green ash, common hackberry.	Plains cottonwood, golden willow.
LaA, LaB, LaC Lawther	Siberian peashrub, silver buffaloberry, American plum, Peking cotoneaster, lilac.	Green ash, Rocky Mt. juniper, Russian-olive, Siberian crabapple, common chokecherry.	Siberian elm, ponderosa pine.	---
LbB Lefor	American plum, silver buffaloberry.	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub.	Siberian elm, ponderosa pine, bur oak, Russian-olive.	---
MaB Manning	Siberian peashrub, lilac.	Siberian elm, ponderosa pine, common hackberry, green ash, Russian-olive, eastern redcedar, Rocky Mt. juniper.	---	---
MbB Marmarth	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35
McA, McB, McC: Morton	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
MdC*:				
Morton	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Lantry	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, lilac, silver buffaloberry.	Ponderosa pine, Siberian elm, green ash, Russian-olive.	---	---
MdD*:				
Morton	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Lantry.				
MeD*:				
Morton	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Rhoades.				
Pa: Parshall	Siberian peashrub, lilac.	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Pb. Psamments				

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--			
	<8	8-15	16-25	26-35
RaA, RaC: Reeder	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
RbB*:				
Reeder	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Amor	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
RcC*:				
Reeder	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Lantry	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, lilac, silver buffaloberry.	Ponderosa pine, Siberian elm, green ash, Russian-olive.	---	---
RdB*:				
Reeder	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Rhoades.				
ReB*:				
Regent	Lilac	Russian-olive, Siberian peashrub, common chokecherry, Rocky Mt. juniper, Tatarian honeysuckle.	Siberian elm, green ash, ponderosa pine, blue spruce, Black Hills spruce.	---

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35
ReB*:				
Daglum-----------	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---
RfB*:				
Regent-----------	Lilac------------	Russian-olive, Siberian peashrub, common chokecherry, Rocky Mt. juniper, Tatarian honeysuckle.	Siberian elm, green ash, ponderosa pine, blue spruce, Black Hills spruce.	---
Savage-----------	Lilac------------	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
RhD*:				
Regent-----------	Lilac------------	Russian-olive, Siberian peashrub, common chokecherry, Rocky Mt. juniper, Tatarian honeysuckle.	Siberian elm, green ash, ponderosa pine, blue spruce, Black Hills spruce.	---
Wayden.				
RkD*:				
Rhoades.				
Cabba.				
RmC*:				
Rhoades.				
Daglum-----------	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---
Slickspots.				
RnD*:				
Rhoades.				
Rock outcrop.				
RoE*:				
Rock outcrop.				
Cabba.				

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--			
	<8	8-15	16-25	26-35
SaA: Savage	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
SbA*:				
Savage	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Daglum	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---
Sc: Shambo	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Sd. Shambo				
SeA: Stady	Siberian peashrub, lilac.	Siberian elm, ponderosa pine, common hackberry, green ash, Russian-olive, eastern redcedar, Rocky Mt. juniper.	---	---
Sh*:				
Lohler	Lilac	Russian-olive, Rocky Mt. juniper, Siberian peashrub, American plum.	Ponderosa pine, blue spruce, Black Hills spruce, green ash, common hackberry.	Plains cottonwood, golden willow.
Trembles	Lilac	Russian-olive, Rocky Mt. juniper, Siberian peashrub, American plum.	Ponderosa pine, blue spruce, Black Hills spruce, green ash, common hackberry.	Plains cottonwood, golden willow.

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35
Ta. Trembles	Lilac	Russian-olive, Rocky Mt. juniper, Siberian peashrub, American plum.	Ponderosa pine, blue spruce, Black Hills spruce, green ash, common hackberry.	Plains cottonwood, golden willow.
Tb. Trembles				
TcD*: Twilight.				
Marmarth	Lilac	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Parchin	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---
VaC*: Vebar	American plum, silver buffaloberry, lilac.	Rocky Mt. juniper, green ash, Siberian peashrub, eastern redcedar, common chokecherry, Siberian crabapple.	Siberian elm, ponderosa pine, bur oak, Russian-olive.	---
Cohagen.				
VaD*: Vebar.				
Cohagen.				
VbB*: Vebar	American plum, silver buffaloberry, lilac.	Rocky Mt. juniper, green ash, Siberian peashrub, eastern redcedar, common chokecherry, Siberian crabapple.	Siberian elm, ponderosa pine, bur oak, Russian-olive.	---
Tally	American plum, silver buffaloberry, lilac.	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub.	Siberian elm, ponderosa pine, bur oak, Russian-olive.	---
WaD, WbA. Wabek				

See footnote at end of table.

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--			
	<8	8-15	16-25	26-35
WcA----------------- Watrous	Siberian peashrub, lilac.	Siberian elm, ponderosa pine, common hackberry, green ash, Russian-olive, eastern redcedar, Rocky Mt. juniper.	---	---
YaB, YaC----------- Yegen	Lilac---------------	Green ash, Siberian crabapple, Rocky Mt. juniper, common chokecherry, Siberian peashrub, American plum.	Siberian elm, ponderosa pine, blue spruce, Black Hills spruce, Russian-olive.	---
Za. Zeona				

* See map unit description for the composition and behavior of the map unit.

TABLE 8.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates the soil was not rated]

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
AaB*:									
Absher	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Loburn	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
AbC*:									
Absher	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Slickspots.									
Ac*:									
Absher	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Trembles	Very poor	Fair	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
Slickspots.									
AdD*:									
Amor	Fair	Good	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Cabba	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
Ar Arnegard	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
Ba*. Badland									
Bb Banks	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
BcA*:									
Belfield	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Grail	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
BdB*:									
Belfield	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Marmarth	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
BeC*:									
Belfield	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Morton	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
BfA*:									
Belfield	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Rhoades	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
BhE*:									
Blackhall	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
Cabbart	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
CaE*:									
Cabba	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
Lantry	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
CbD*:									
Cabba	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
Trembles	Very poor	Fair	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Good.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
CcD*:									
Cabba	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
Wayden	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
CdE*:									
Cohagen	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
Vebar	Very poor	Very poor	Good	Poor	Very poor	Very poor	Very poor	Very poor	Good.
DaB*:									
Daglum	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
Felor	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Db*:									
Dimmick	Fair	Poor	Fair	Poor	Fair	Fair	Fair	Poor	Fair.
Heil	Poor	Poor	Poor	Poor	Fair	Fair	Poor	Poor	Poor.
FaA, FaB Farnuf	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
FbA*:									
Farnuf	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Daglum	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
FcB*:									
Felor	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Yegen	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
FcC*:									
Felor	Fair	Good	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Yegen	Fair	Good	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Fd. Fluvaquents									
Ga Grail	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
LaA Lawther	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
LaB, LaC Lawther	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
LbB Lefor	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
MaB Manning	Fair	Fair	Good	Poor	Very poor	Very poor	Fair	Very poor	Good.
MbB Marmarth	Fair	Good	Good	Good	Very poor	Very poor	Fair	Very poor	Good.
McA, McB Morton	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
McC Morton	Fair	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
MdC*:									
Morton	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Lantry	Poor	Fair	Fair	Poor	Very poor	Very poor	Poor	Very poor	Fair.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
MdD*:									
Morton	Fair	Good	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Lantry	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
MeD*:									
Morton	Poor	Good	Good	Poor	Very poor	Very poor	Poor	Very poor	Good.
Rhoades	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Pa Parshall	Fair	Fair	Good	Good	Very poor	Very poor	Fair	Very poor	Good.
Pb. Psamments									
RaA, RaC Reeder	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
RbB*:									
Reeder	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Amor	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
RcC*:									
Reeder	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Lantry	Poor	Fair	Fair	Poor	Very poor	Very poor	Poor	Very poor	Fair.
RdB*:									
Reeder	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Rhoades	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
ReB*:									
Regent	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Daglum	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
RfB*:									
Regent	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Savage	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
RhD*:									
Regent	Fair	Good	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Wayden	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
RkD*:									
Rhoades	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Cabba	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
RmC*:									
Rhoades	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Daglum	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
Slickspots.									
RnD*:									
Rhoades	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Rock outcrop.									
RoE*: Rock outcrop.									

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
RoE*:									
Cabba	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
SaA Savage	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
SbA*:									
Savage	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Daglum	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
Sc Shambo	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Sd Shambo	Very poor	Poor	Good	Poor	Very poor	Very poor	Poor	Very poor	Good.
SeA Stady	Fair	Fair	Good	Poor	Very poor	Very poor	Fair	Very poor	Good.
Sh*:									
Lohler	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
Trembles	Good	Fair	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
Ta Trembles	Good	Fair	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
Tb Trembles	Very poor	Fair	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
TcD*:									
Twilight	Very poor	Very poor	Good	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
Marmarth	Poor	Good	Good	Good	Very poor	Very poor	Fair	Very poor	Good.
Parchin	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
VaC*:									
Vebar	Poor	Fair	Good	Fair	Very poor	Very poor	Poor	Very poor	Good.
Cohagen	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
VaD*:									
Vebar	Very poor	Very poor	Good	Poor	Very poor	Very poor	Very poor	Very poor	Good.
Cohagen	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
VbB*:									
Vebar	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Tally	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
WaD, WbA Wabek	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
WcA Watrous	Fair	Good	Good	Poor	Very poor	Very poor	Fair	Very poor	Good.
YaB Yegen	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
YaC Yegen	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Za Zeona	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.

* See map unit description for the composition and behavior of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some of the terms used in this table to 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	Camp areas	Picnic areas	Playgrounds	Paths and trails
AaB*:				
Absher	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Loburn	Moderate: percs slowly.	Moderate: dusty.	Moderate: percs slowly.	Moderate: dusty.
AbC*:				
Absher	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Slickspots.				
Ac*:				
Absher	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Trembles	Severe: floods.	Slight	Moderate: floods.	Slight.
Slickspots.				
AdD*:				
Amor	Slight	Slight	Severe: slope.	Slight.
Cabba	Moderate: slope.	Moderate: slope.	Severe: slope, depth to rock.	Slight.
Ar Arnegard	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
Ba*. Badland				
Bb Banks	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
BcA*:				
Belfield	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
Grail	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
BdB*:				
Belfield	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
Marmarth	Slight	Slight	Moderate: slope.	Slight.
BeC*:				
Belfield	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Morton	Slight	Slight	Moderate: depth to rock, slope.	Slight.
BfA*:				
Belfield	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
BfA*:				
Rhoades	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
BhE*:				
Blackhall	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Cabbart	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
CaE*:				
Cabba	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Lantry	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
CbD*:				
Cabba	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope.
Trembles	Severe: floods.	Slight	Moderate: floods.	Slight.
CcD*:				
Cabba	Severe: large stones.	Moderate: large stones, slope.	Severe: large stones, slope.	Severe: large stones.
Wayden	Severe: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Severe: large stones.
CdE*:				
Cohagen	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.
Vebar	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
DaB*:				
Daglum	Slight	Slight	Moderate: slope.	Slight.
Felor	Slight	Slight	Moderate: slope.	Slight.
Db*:				
Dimmick	Severe: floods, wetness, too clayey.	Severe: wetness, too clayey.	Severe: floods, wetness, too clayey.	Severe: too clayey.
Heil	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, floods, percs slowly.	Severe: wetness.
FaA Farnuf	Slight	Slight	Slight	Slight.
FaB Farnuf	Slight	Slight	Moderate: slope.	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
FbA*:				
Farnuf	Slight	Slight	Slight	Slight.
Daglum	Slight	Slight	Slight	Slight.
FcB*:				
Felor	Slight	Slight	Moderate: slope.	Slight.
Yegen	Slight	Slight	Moderate: slope.	Slight.
FcC*:				
Felor	Slight	Slight	Severe: slope.	Slight.
Yegen	Slight	Slight	Severe: slope.	Slight.
Fd. Fluvaquents				
Ga Grail	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
LaA, LaB Lawther	Severe: too clayey.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.
LaC Lawther	Severe: too clayey.	Moderate: too clayey.	Severe: slope, too clayey.	Moderate: too clayey.
LbB Lefor	Slight	Slight	Moderate: slope, depth to rock.	Slight.
MaB Manning	Slight	Slight	Moderate: slope.	Slight.
MbB Marmarth	Slight	Slight	Moderate: slope.	Slight.
McA Morton	Slight	Slight	Moderate: depth to rock.	Slight.
McB Morton	Slight	Slight	Moderate: depth to rock, slope.	Slight.
McC Morton	Slight	Slight	Severe: slope.	Slight.
MdC*:				
Morton	Slight	Slight	Moderate: depth to rock, slope.	Slight.
Lantry	Slight	Slight	Moderate: slope, depth to rock.	Slight.
MdD*:				
Morton	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Lantry	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
MeD*:				
Morton	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Rhoades	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Pa Parshall	Slight	Slight	Moderate: slope.	Slight.
Pb. Psamments				
RaA Reeder	Slight	Slight	Moderate: depth to rock.	Slight.
RaC Reeder	Slight	Slight	Severe: slope.	Slight.
RbB*:				
Reeder	Slight	Slight	Moderate: slope.	Slight.
Amor	Slight	Slight	Moderate: depth to rock, slope.	Slight.
RcC*:				
Reeder	Slight	Slight	Moderate: slope.	Slight.
Lantry	Slight	Slight	Moderate: slope, depth to rock.	Slight.
RdB*:				
Reeder	Slight	Slight	Moderate: slope.	Slight.
Rhoades	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
ReB*:				
Regent	Moderate: too clayey.	Slight	Moderate: too clayey, depth to rock.	Slight.
Daglum	Slight	Slight	Moderate: slope.	Slight.
RfB*:				
Regent	Moderate: too clayey.	Slight	Moderate: too clayey, depth to rock.	Slight.
Savage	Moderate: too clayey.	Slight	Moderate: slope, too clayey.	Slight.
RhD*:				
Regent	Moderate: too clayey.	Slight	Severe: slope.	Slight.
Wayden	Moderate: slope, too clayey.	Moderate: slope.	Severe: depth to rock, slope.	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
RkD*:				
Rhoades	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Cabba	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope.
RmC*:				
Rhoades	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Daglum	Moderate: percs slowly.	Slight	Moderate: percs slowly, slope.	Slight.
Slickspots.				
RnD*:				
Rhoades	Moderate: percs slowly, slope.	Moderate: slope.	Severe: slope.	Slight.
Rock outcrop.				
RoE*:				
Rock outcrop.				
Cabba	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
SaA Savage	Moderate: too clayey.	Slight	Moderate: too clayey.	Slight.
SbA*:				
Savage	Moderate: too clayey.	Slight	Moderate: too clayey.	Slight.
Daglum	Slight	Slight	Slight	Slight.
Sc Shambo	Slight	Slight	Slight	Slight.
Sd Shambo	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
SeA Stady	Slight	Slight	Slight	Slight.
Sh*:				
Lohler	Severe: floods, too clayey.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.
Trembles	Severe: floods.	Slight	Moderate: floods.	Slight.
Ta, Tb Trembles	Severe: floods.	Slight	Moderate: floods.	Slight.
TcD*:				
Twilight	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Marmarth	Slight	Slight	Moderate: slope.	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
TcD*:				
Parchin	Moderate: percs slowly.	Slight	Moderate: slope, depth to rock, percs slowly.	Slight.
VaC*:				
Vebar	Slight	Slight	Moderate: depth to rock, slope.	Slight.
Cohagen	Slight	Slight	Severe: depth to rock, slope.	Slight.
VaD*:				
Vebar	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Cohagen	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Moderate: slope.
VbB*:				
Vebar	Slight	Slight	Moderate: depth to rock, slope.	Slight.
Tally	Slight	Slight	Moderate: slope.	Slight.
WaD Wabek	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
WbA Wabek	Moderate: small stones.	Moderate: small stones.	Moderate: small stones.	Moderate: small stones.
WcA Watrous	Slight	Slight	Severe: depth to rock.	Slight.
YaB Yegen	Slight	Slight	Moderate: slope.	Slight.
YaC Yegen	Slight	Slight	Severe: slope.	Slight.
Za Zeona	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.

* See map unit description for the composition and behavior of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some of the terms used in this table to 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
AaB*:					
Absher	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Loburn	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
AbC*:					
Absher	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Slickspots.					
Ac*:					
Absher	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Trembles	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Slickspots.					
AdD*:					
Amor	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.
Cabba	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock.
Ar Arnegard	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Ba*. Badland					
Bb Banks	Severe: floods, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
BcA*:					
Belfield	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Grail	Severe: floods.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.
BdB*:					
Belfield	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Marmarth	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
BeC*:					
Belfield	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Morton	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: slope, shrink-swell.	Moderate: low strength, shrink-swell.
BfA*:					
Belfield	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Rhoades	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
BhE*:					
Blackhall	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
Cabbart	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
CaE*:					
Cabba	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
Lantry	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CbD*:					
Cabba	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
Trembles	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
CcD*:					
Cabba	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: large stones, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: large stones.
Wayden	Severe: depth to rock, large stones.	Severe: shrink-swell, low strength, large stones.	Severe: shrink-swell, low strength, depth to rock.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.
CdE*:					
Cohagen	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
Vebar	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
DaB*:					
Daglum	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Felor	Moderate: too clayey.	Severe: low strength, shrink-swell.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.	Moderate: low strength, shrink-swell.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Db*:					
Dimmick	Severe: floods, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.
Heil	Severe: wetness, floods.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.
FaA, FaB Farnuf	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell, low strength.
FbA*:					
Farnuf	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell, low strength.
Daglum	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
FcB*, FcC*:					
Felor	Moderate: too clayey.	Severe: low strength, shrink-swell.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.	Moderate: low strength, shrink-swell.
Yegen	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, shrink-swell.
Fd. Fluvaquents					
Ga Grail	Severe: floods.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.
LaA, LaB, LaC Lawther	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
LbB Lefor	Moderate: depth to rock.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, depth to rock, low strength.	Moderate: shrink-swell, slope, low strength.	Moderate: low strength.
MaB Manning	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
MbB Marmarth	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.
McA Morton	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.
McB, McC Morton	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: slope, shrink-swell.	Moderate: low strength, shrink-swell.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
MdC*:					
Morton	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: slope, shrink-swell.	Moderate: low strength, shrink-swell.
Lantry	Moderate: depth to rock.	Moderate: low strength, shrink-swell.	Moderate: depth to rock, low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Moderate: low strength, depth to rock.
MdD*:					
Morton	Moderate: depth to rock, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Moderate: low strength, shrink-swell.
Lantry	Moderate: slope, depth to rock.	Moderate: slope, low strength, shrink-swell.	Moderate: slope, depth to rock, low strength.	Severe: slope.	Moderate: low strength, depth to rock.
MeD*:					
Morton	Moderate: depth to rock, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Moderate: low strength, shrink-swell.
Rhoades	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Pa Parshall	Slight	Slight	Slight	Slight	Moderate: frost action.
Pb. Psamments					
RaA Reeder	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action, depth to rock.
RaC Reeder	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action, depth to rock.
RbB*:					
Reeder	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action, depth to rock.
Amor	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.
RcC*:					
Reeder	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action, depth to rock.
Lantry	Moderate: depth to rock.	Moderate: low strength, shrink-swell.	Moderate: depth to rock, low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Moderate: low strength, depth to rock.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
RdB*:					
Reeder-----------	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action, depth to rock.
Rhoades----------	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
ReB*:					
Regent-----------	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.
Daglum-----------	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
RfB*:					
Regent-----------	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Savage-----------	Moderate: too clayey.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
RhD*:					
Regent-----------	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Wayden-----------	Severe: depth to rock.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength, depth to rock.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength.
RkD*:					
Rhoades----------	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Cabba------------	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
RmC*:					
Rhoades----------	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Daglum-----------	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Slickspots.					
RnD*:					
Rhoades----------	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Rock outcrop.					
RoE*:					
Rock outcrop.					

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
RoE*:					
Cabba	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
SaA Savage	Moderate: too clayey.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
SbA*:					
Savage	Moderate: too clayey.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
Daglum	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Sc Shambo	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: frost action, shrink-swell, low strength.
Sd Shambo	Severe: floods, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
SeA Stady	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action, low strength.
Sh*:					
Lohler	Moderate: too clayey, floods.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength.
Trembles	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Ta, Tb Trembles	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
TcD*:					
Twilight	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, low strength.
Marmarth	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.
Parchin	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell, depth to rock.	Moderate: slope, shrink-swell.	Moderate: shrink-swell, low strength.
VaC*:					
Vebar	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Slight.
Cohagen	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock, slope.	Moderate: depth to rock.
VaD*:					
Vebar	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
VaD*:					
Cohagen	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
VbB*:					
Vebar	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Slight	Slight.
Tally	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: low strength, frost action.
WaD Wabek	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WbA Wabek	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
WcA Watrous	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
YaB, YaC Yegen	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, shrink-swell.
Za Zeona	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.

* See map unit description for the composition and behavior of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some of the terms used in this table to 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
AaB*:					
Absher	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Loburn	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
AbC*:					
Absher	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
Slickspots.					
Ac*:					
Absher	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
Trembles	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
Slickspots.					
AdD*:					
Amor	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Fair: area reclaim.
Cabba	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Ar Arnegard	Severe: floods, wetness.	Moderate: seepage, wetness.	Severe: floods.	Severe: floods.	Good.
Ba*. Badland					
Bb Banks	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Fair: too sandy.
BcA*:					
Belfield	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
Grail	Severe: percs slowly, floods, wetness.	Slight	Severe: floods.	Severe: floods.	Fair: too clayey.
BdB*:					
Belfield	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
Marmarth	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
BeC*:					
Belfield	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.

See footnote at end of table.

TABLE 11.--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
BeC*:					
Morton	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
BfA*:					
Belfield	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
Rhoades	Severe: percs slowly.	Slight	Severe: too clayey, depth to rock.	Slight	Poor: too clayey.
BhE*:					
Blackhall	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Poor: slope, area reclaim.
Cabbart	Severe: slope, depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Poor: slope, area reclaim.
CaE*:					
Cabba	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim.
Lantry	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope, area reclaim.
CbD*:					
Cabba	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: slope, area reclaim.
Trembles	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
CcD*:					
Cabba	Severe: depth to rock, large stones.	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones.	Severe: slope, depth to rock.	Poor: area reclaim, large stones.
Wayden	Severe: percs slowly, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock.	Poor: area reclaim, large stones.
CdE*:					
Cohagen	Severe: depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, depth to rock, slope.	Severe: seepage, slope, depth to rock.	Poor: slope, area reclaim.
Vebar	Severe: depth to rock.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: area reclaim, slope.
DaB*:					
Daglum	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Felor	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.

See footnote at end of table.

TABLE 11.--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
Db*:					
Dimmick	Severe: floods, wetness, percs slowly.	Slight	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: wetness, too clayey.
Heil	Severe: percs slowly, wetness, floods.	Slight	Severe: too clayey, wetness.	Severe: floods, wetness.	Poor: too clayey, wetness.
FaA Farnuf	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
FaB Farnuf	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Good.
FbA*:					
Farnuf	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
Daglum	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
FcB*:					
Felor	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Yegen	Severe: depth to rock.	Severe: seepage.	Severe: depth to rock, seepage.	Slight	Fair: too clayey.
FcC*:					
Felor	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Yegen	Severe: depth to rock.	Severe: seepage.	Severe: depth to rock, seepage.	Slight	Fair: too clayey.
Fd. Fluvaquents					
Ga Grail	Severe: percs slowly, floods, wetness.	Slight	Severe: floods.	Severe: floods.	Fair: too clayey.
LaA Lawther	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
LaB Lawther	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
LaC Lawther	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey.
LbB Lefor	Severe: depth to rock.	Moderate: depth to rock, slope, seepage.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
MaB Manning	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: area reclaim.

See footnote at end of table.

TABLE 11.--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
MbB----------------- Marmarth	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
McA, McB------------ Morton	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
McC----------------- Morton	Severe: depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: slope, depth to rock.	Poor: area reclaim.
MdC*:					
Morton-------------	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
Lantry-------------	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
MdD*:					
Morton-------------	Severe: depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: slope, depth to rock.	Poor: area reclaim.
Lantry-------------	Severe: depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: slope, depth to rock.	Poor: area reclaim.
MeD*:					
Morton-------------	Severe: depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: slope, depth to rock.	Poor: area reclaim.
Rhoades------------	Severe: percs slowly.	Severe: slope.	Severe: too clayey, depth to rock.	Slight-----------	Poor: too clayey.
Pa------------------ Parshall	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Pb. Psamments					
RaA----------------- Reeder	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
RaC----------------- Reeder	Severe: depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
RbB*:					
Reeder-------------	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
Amor---------------	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
RcC*:					
Reeder-------------	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
Lantry-------------	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.

See footnote at end of table.

TABLE 11.--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
RdB*:					
Reeder	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
Rhoades	Severe: percs slowly.	Moderate: slope.	Severe: too clayey, depth to rock.	Slight	Poor: too clayey.
ReB*:					
Regent	Severe: percs slowly, depth to rock.	Moderate: slope, depth to rock.	Severe: too clayey, depth to rock.	Moderate: depth to rock.	Poor: too clayey, area reclaim.
Daglum	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
RfB*:					
Regent	Severe: percs slowly, depth to rock.	Moderate: slope, depth to rock.	Severe: too clayey, depth to rock.	Moderate: depth to rock.	Poor: too clayey, area reclaim.
Savage	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Fair: too clayey.
RhD*:					
Regent	Severe: percs slowly, depth to rock.	Severe: slope.	Severe: too clayey, depth to rock.	Moderate: slope, depth to rock.	Poor: too clayey, area reclaim.
Wayden	Severe: percs slowly, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
RkD*:					
Rhoades	Severe: percs slowly.	Moderate: slope.	Severe: too clayey, depth to rock.	Slight	Poor: too clayey.
Cabba	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Poor: slope, area reclaim.
RmC*:					
Rhoades	Severe: percs slowly.	Moderate: slope.	Severe: too clayey, depth to rock.	Slight	Poor: too clayey.
Daglum	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Slickspots.					
RnD*:					
Rhoades	Severe: percs slowly.	Severe: slope.	Severe: too clayey, depth to rock.	Moderate: slope.	Poor: too clayey.
Rock outcrop.					
RoE*:					
Rock outcrop.					
Cabba	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim.

See footnote at end of table.

TABLE 11.--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
SaA: Savage	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Fair: too clayey.
SbA*:					
Savage	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Fair: too clayey.
Daglum	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
Sc: Shambo	Slight	Moderate: seepage.	Severe: seepage.	Slight	Good.
Sd: Shambo	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
SeA: Stady	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: area reclaim.
Sh*:					
Lohler	Severe: percs slowly, floods.	Severe: floods.	Severe: too clayey, floods.	Severe: floods.	Poor: too clayey.
Trembles	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
Ta, Tb: Trembles	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
TcD*:					
Twilight	Severe: depth to rock.	Severe: slope, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: area reclaim.
Marmarth	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
Parchin	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: area reclaim.
VaC*:					
Vebar	Severe: depth to rock.	Severe: seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: area reclaim.
Cohagen	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Severe: seepage, depth to rock.	Poor: area reclaim.
VaD*:					
Vebar	Severe: depth to rock.	Severe: seepage, slope.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: area reclaim, slope.
Cohagen	Severe: depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, depth to rock.	Severe: seepage, slope, depth to rock.	Poor: area reclaim, slope.
VbB*:					
Vebar	Severe: depth to rock.	Severe: seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: area reclaim.

See footnote at end of table.

TABLE 11.--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
VbB*:					
Tally	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
WaD: Wabek	Severe: slope.	Severe: seepage, slope.	Severe: too sandy, seepage.	Severe: seepage, slope.	Poor: too sandy, slope, seepage.
WbA: Wabek	Slight	Severe: seepage.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy, seepage.
WcA: Watrous	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
YaB, YaC: Yegen	Severe: depth to rock.	Severe: seepage.	Severe: depth to rock, seepage.	Slight	Fair: too clayey.
Za: Zeona	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.

* See map unit description for the composition and behavior of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry means soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AaB*:				
Absher	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess salt.
Loburn	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess salt.
AbC*:				
Absher	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess salt.
Slickspots.				
Ac*:				
Absher	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess salt.
Trembles	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
Slickspots.				
AdD*:				
Amor	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
Cabba	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, area reclaim.
Ar Arnegard	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Ba*. Badland				
Bb Banks	Good	Poor: excess fines.	Unsuited: excess fines.	Poor: thin layer.
BcA*:				
Belfield	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Grail	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
BdB*:				
Belfield	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Marmarth	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
BeC*:				
Belfield	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Morton	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, area reclaim.
BfA*:				
Belfield	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Rhoades	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, excess salt.
BhE*:				
Blackhall	Poor: slope, thin layer, area reclaim.	Poor: excess fines.	Unsuited: excess fines.	Poor: slope.
Cabbart	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, area reclaim.
CaE*:				
Cabba	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, area reclaim.
Lantry	Poor: area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
CbD*:				
Cabba	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, area reclaim.
Trembles	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
CcD*:				
Cabba	Poor: large stones, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones, thin layer, area reclaim.
Wayden	Poor: shrink-swell, low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: area reclaim, large stones, thin layer.
CdE*:				
Cohagen	Poor: thin layer, area reclaim, slope.	Poor: thin layer, excess fines.	Unsuited: excess fines.	Poor: thin layer, slope, area reclaim.
Vebar	Poor: thin layer, area reclaim.	Poor: excess fines.	Unsuited: excess fines.	Fair: slope, area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
DaB*:				
Daglum	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
Felor	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Db*:				
Dimmick	Poor: wetness, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness, too clayey.
Heil	Poor: wetness, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness, too clayey.
FaA, FaB Farnuf	Fair: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
FbA*:				
Farnuf	Fair: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Daglum	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
FcB*, FcC*:				
Felor	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Yegen	Fair: area reclaim, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Fd. Fluvaquents.				
Ga Grail	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
LaA, LaB, LaC Lawther	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
LbB Lefor	Poor: area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
MaB Manning	Good	Poor: excess fines.	Poor: excess fines.	Fair: area reclaim.
MbB Marmarth	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
McA, McB, McC Morton	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, area reclaim.
MdC*:				
Morton	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MdC*:				
Lantry	Poor: area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
MdD*:				
Morton	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, slope, area reclaim.
Lantry	Poor: area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, area reclaim.
MeD*:				
Morton	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, slope, area reclaim.
Rhoades	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, excess salt.
Pa Parshall	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
Pb. Psamments				
RaA, RaC Reeder	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
RbB*:				
Reeder	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
Amor	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
RcC*:				
Reeder	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
Lantry	Poor: area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
RdB*:				
Reeder	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
Rhoades	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, excess salt.
ReB*:				
Regent	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, area reclaim.
Daglum	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RfB*:				
Regent	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, area reclaim.
Savage	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
RhD*:				
Regent	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, area reclaim.
Wayden	Poor: shrink-swell, low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, area reclaim.
RkD*:				
Rhoades	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, excess salt.
Cabba	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, area reclaim.
RmC*:				
Rhoades	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, excess salt.
Daglum	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
Slickspots.				
RnD*:				
Rhoades	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, excess salt.
Rock outcrop.				
RoE*:				
Rock outcrop.				
Cabba	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, area reclaim.
SaA Savage	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
SbA*:				
Savage	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Daglum	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
Sc Shambo	Fair: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Sd: Shambo	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
SeA: Stady	Good	Fair: excess fines.	Fair: excess fines.	Fair: area reclaim.
Sh*:				
Lohler	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Trembles	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
Ta, Tb: Trembles	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
TcD*:				
Twilight	Poor: thin layer, area reclaim.	Poor: excess fines, thin layer.	Unsuited: excess fines.	Fair: slope, area reclaim.
Marmarth	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
Parchin	Fair: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
VaC*:				
Vebar	Poor: thin layer, area reclaim.	Poor: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
Cohagen	Poor: thin layer, area reclaim.	Poor: thin layer, excess fines.	Unsuited: excess fines.	Poor: thin layer, area reclaim.
VaD*:				
Vebar	Poor: thin layer, area reclaim.	Poor: excess fines.	Unsuited: excess fines.	Fair: slope, area reclaim.
Cohagen	Poor: thin layer, area reclaim.	Poor: thin layer, excess fines.	Unsuited: excess fines.	Poor: thin layer, slope, area reclaim.
VbB*:				
Vebar	Poor: thin layer, area reclaim.	Poor: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
Tally	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
WaD: Wabek	Fair: slope.	Good	Good	Poor: thin layer, small stones, slope.
WbA: Wabek	Good	Good	Good	Poor: thin layer, small stones.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
WcA-------------------- Watrous	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: area reclaim, thin layer.
YaB, YaC--------------- Yegen	Fair: area reclaim, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Za--------------------- Zeona	Good------------------	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.

* See map unit description for the composition and behavior of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some of the terms used in this table to 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	Drainage	Irrigation	Terraces and diversions	Grassed waterways
AaB*:						
Absher	Slope	Hard to pack, piping.	Slope, excess sodium, excess salt.	Slope, excess sodium, excess salt.	Percs slowly	Excess salt, excess sodium.
Loburn	Favorable	Hard to pack, excess salt.	Not needed	Slow intake, percs slowly, excess salt.	Percs slowly	Excess salt, erodes easily, percs slowly.
AbC*:						
Absher	Slope	Hard to pack, piping.	Excess sodium, percs slowly, excess salt.	Excess sodium, slow intake, excess salt.	Percs slowly	Excess salt, excess sodium, slope.
Slickspots.						
Ac*:						
Absher	Favorable	Hard to pack, piping.	Excess sodium, percs slowly, excess salt.	Excess sodium, slow intake, excess salt.	Percs slowly	Excess salt, excess sodium.
Trembles	Seepage	Piping	Floods	Floods	Soil blowing	Favorable.
Slickspots.						
AdD*:						
Amor	Seepage, depth to rock, slope.	Thin layer	Not needed	Rooting depth, slope.	Favorable	Slope, depth to rock.
Cabba	Slope, seepage, depth to rock.	Thin layer, piping.	Not needed	Rooting depth, slope.	Depth to rock, slope.	Rooting depth, slope, droughty.
Ar Arnegard	Seepage	Piping	Not needed	Floods	Not needed	Favorable.
Ba*. Badland						
Bb Banks	Seepage	Hard to pack, piping.	Not needed	Fast intake, floods.	Not needed	Not needed.
BcA*:						
Belfield	Favorable	Hard to pack, piping.	Not needed	Excess sodium, excess salt, percs slowly.	Not needed	Excess sodium, excess salt, percs slowly.
Grail	Favorable	Favorable	Floods	Slow intake, floods.	Not needed	Favorable.
BdB*:						
Belfield	Favorable	Hard to pack, piping.	Not needed	Excess sodium, excess salt, percs slowly.	Not needed	Excess sodium, excess salt, percs slowly.
Marmarth	Seepage, depth to rock.	Piping, thin layer.	Not needed	Rooting depth	Favorable	Depth to rock.
BeC*:						
Belfield	Favorable	Hard to pack, piping.	Not needed	Excess sodium, excess salt, percs slowly.	Percs slowly	Excess sodium, excess salt, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
BeC*:						
Morton	Depth to rock, slope.	Thin layer	Not needed	Rooting depth, slope.	Favorable	Depth to rock.
BfA*:						
Belfield	Favorable	Hard to pack, piping.	Not needed	Excess sodium, excess salt, percs slowly.	Not needed	Excess sodium, excess salt, percs slowly.
Rhoades	Favorable	Hard to pack	Not needed	Excess sodium, excess salt, slow intake.	Percs slowly	Excess sodium, excess salt, percs slowly.
BhE*:						
Blackhall	Slope, depth to rock.	Thin layer	Not needed	Droughty, rooting depth, slope.	Slope, depth to rock.	Slope, rooting depth, droughty.
Cabbart	Slope, depth to rock.	Thin layer	Not needed	Rooting depth, slope.	Slope, depth to rock.	Slope, erodes easily, rooting depth.
CaE*:						
Cabba	Slope, seepage, depth to rock.	Thin layer, piping.	Not needed	Rooting depth, slope.	Depth to rock, slope.	Rooting depth, slope, droughty.
Lantry	Depth to rock, slope.	Thin layer, piping.	Not needed	Slope, rooting depth, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
CbD*:						
Cabba	Slope, seepage, depth to rock.	Thin layer, piping.	Not needed	Rooting depth, slope.	Depth to rock, slope.	Rooting depth, slope, droughty.
Trembles	Seepage	Piping	Floods	Floods, erodes easily.	Piping, erodes easily.	Erodes easily.
CcD*:						
Cabba	Slope, seepage, depth to rock.	Large stones, thin layer.	Not needed	Rooting depth, slope.	Depth to rock, slope.	Large stones, rooting depth, slope.
Wayden	Depth to rock, slope.	Thin layer, hard to pack.	Not needed	Large stones, droughty, percs slowly.	Slope, depth to rock, large stones.	Large stones, slope, droughty.
CdE*:						
Cohagen	Seepage, slope, depth to rock.	Thin layer, seepage, piping.	Not needed	Slope, droughty, rooting depth.	Depth to rock, slope.	Slope, rooting depth, depth to rock.
Vebar	Seepage, depth to rock, slope.	Seepage	Not needed	Soil blowing, slope.	Depth to rock, slope.	Slope, depth to rock.
DaB*:						
Daglum	Depth to rock	Hard to pack	Not needed	Excess sodium, excess salt, slow intake.	Percs slowly	Excess sodium, excess salt, percs slowly.
Felor	Favorable	Hard to pack	Not needed	Percs slowly	Percs slowly	Percs slowly.
Db*:						
Dimmick	Favorable	Hard to pack, wetness.	Floods, percs slowly.	Wetness, slow intake.	Percs slowly, wetness.	Not needed.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Db*:						
Heil	Favorable	Hard to pack, piping.	Floods, percs slowly, excess sodium.	Slow intake, excess sodium, floods.	Not needed	Not needed.
FaA Farnuf	Seepage	Favorable	Not needed	Favorable	Not needed	Favorable.
FaB Farnuf	Seepage	Favorable	Not needed	Favorable	Favorable	Favorable.
FbA*:						
Farnuf	Seepage	Favorable	Not needed	Favorable	Not needed	Favorable.
Daglum	Depth to rock	Hard to pack	Not needed	Excess sodium, excess salt, slow intake.	Not needed	Excess sodium, excess salt, percs slowly.
FcB*:						
Felor	Favorable	Hard to pack	Not needed	Percs slowly	Percs slowly	Percs slowly.
Yegen	Slope, depth to rock, seepage.	Thin layer, seepage, piping.	Not needed	Soil blowing	Favorable	Slope.
FcC*:						
Felor	Slope	Hard to pack	Not needed	Slope, percs slowly.	Percs slowly	Percs slowly.
Yegen	Slope, depth to rock, seepage.	Thin layer, seepage, piping.	Not needed	Slope, soil blowing.	Favorable	Slope.
Fd. Fluvaquents						
Ga Grail	Favorable	Hard to pack	Floods	Floods	Not needed	Favorable.
LaA Lawther	Favorable	Hard to pack	Not needed	Percs slowly, slow intake.	Not needed	Percs slowly.
LaB Lawther	Favorable	Hard to pack	Not needed	Percs slowly, slow intake.	Percs slowly	Percs slowly.
LaC Lawther	Slope	Hard to pack	Not needed	Slope, percs slowly, slow intake.	Percs slowly	Percs slowly.
LbB Lefor	Depth to rock, seepage.	Seepage, thin layer.	Not needed	Soil blowing, rooting depth.	Soil blowing	Depth to rock.
MaB Manning	Seepage	Seepage	Not needed	Droughty, soil blowing.	Soil blowing	Droughty.
MbB Marmarth	Seepage, depth to rock.	Piping, thin layer.	Not needed	Rooting depth	Favorable	Depth to rock.
McA, McB, McC Morton	Depth to rock	Thin layer	Not needed	Rooting depth	Favorable	Depth to rock.
MdC*:						
Morton	Depth to rock	Thin layer	Not needed	Rooting depth	Favorable	Depth to rock.
Lantry	Depth to rock, slope.	Thin layer, piping.	Not needed	Rooting depth, erodes easily.	Depth to rock, erodes easily.	Erodes easily, depth to rock.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
MdD*:						
Morton----------	Depth to rock, slope.	Thin layer-----	Not needed-----	Rooting depth, slope.	Favorable------	Depth to rock.
Lantry----------	Depth to rock, slope.	Thin layer, piping.	Not needed-----	Slope, rooting depth, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
MeD*:						
Morton----------	Depth to rock, slope.	Thin layer-----	Not needed-----	Rooting depth, slope.	Favorable------	Depth to rock.
Rhoades----------	Slope----------	Hard to pack, piping.	Not needed-----	Excess sodium, excess salt, slow intake.	Percs slowly---	Percs slowly, excess sodium, excess salt.
Pa---------------- Parshall	Seepage--------	Seepage--------	Not needed-----	Soil blowing---	Soil blowing---	Favorable.
Pb. Psamments						
RaA, RaC---------- Reeder	Seepage, depth to rock.	Thin layer-----	Not needed-----	Rooting depth--	Favorable------	Depth to rock.
RbB*:						
Reeder----------	Seepage, depth to rock.	Thin layer-----	Not needed-----	Rooting depth--	Favorable------	Depth to rock.
Amor------------	Seepage, depth to rock.	Thin layer-----	Not needed-----	Rooting depth, slope.	Favorable------	Depth to rock.
RcC*:						
Reeder----------	Seepage, depth to rock.	Thin layer-----	Not needed-----	Rooting depth--	Favorable------	Depth to rock.
Lantry----------	Depth to rock, slope.	Thin layer, piping.	Not needed-----	Rooting depth, erodes easily, slope.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
RdB*:						
Reeder----------	Seepage, depth to rock.	Thin layer-----	Not needed-----	Rooting depth--	Favorable------	Depth to rock.
Rhoades----------	Favorable------	Hard to pack, piping.	Not needed-----	Excess sodium, excess salt, slow intake.	Percs slowly---	Percs slowly, excess sodium, excess salt.
ReB*:						
Regent----------	Depth to rock--	Thin layer, hard to pack.	Not needed-----	Rooting depth, slow intake.	Percs slowly---	Depth to rock.
Daglum----------	Depth to rock--	Hard to pack---	Not needed-----	Excess sodium, excess salt, slow intake.	Percs slowly---	Excess sodium, excess salt, percs slowly.
RfB*:						
Regent----------	Depth to rock--	Thin layer, hard to pack.	Not needed-----	Rooting depth, slow intake.	Percs slowly---	Depth to rock.
Savage----------	Favorable------	Hard to pack---	Percs slowly, slope.	Percs slowly, slow intake, slope.	Percs slowly---	Percs slowly.
RhD*:						
Regent----------	Slope, depth to rock.	Thin layer, hard to pack.	Not needed-----	Rooting depth, slow intake, slope.	Percs slowly---	Depth to rock.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
RhD*:						
Wayden	Depth to rock, slope.	Thin layer, hard to pack.	Not needed	Slope, slow intake, percs slowly.	Depth to rock, percs slowly.	Slope, droughty, rooting depth.
RkD*:						
Rhoades	Slope	Hard to pack, piping.	Not needed	Excess sodium, excess salt, slow intake.	Percs slowly	Percs slowly, excess sodium, excess salt.
Cabba	Slope, seepage, depth to rock.	Thin layer, piping.	Not needed	Rooting depth, slope.	Depth to rock, slope.	Rooting depth, slope, droughty.
RmC*:						
Rhoades	Favorable	Hard to pack, piping.	Not needed	Excess sodium, excess salt, slow intake.	Percs slowly	Percs slowly, excess sodium, excess salt.
Daglum	Depth to rock	Hard to pack	Not needed	Excess sodium, excess salt, slow intake.	Percs slowly	Excess sodium, excess salt, percs slowly.
Slickspots.						
RnD*:						
Rhoades	Slope	Hard to pack, piping.	Not needed	Excess sodium, excess salt, slow intake.	Percs slowly	Percs slowly, excess sodium, excess salt.
Rock outcrop.						
RoE*:						
Rock outcrop.						
Cabba	Slope, seepage, depth to rock.	Thin layer, piping.	Not needed	Rooting depth, slope.	Depth to rock, slope.	Rooting depth, slope, droughty.
SaA Savage	Favorable	Hard to pack	Not needed	Percs slowly, slow intake.	Not needed	Percs slowly.
SbA*:						
Savage	Favorable	Hard to pack	Not needed	Percs slowly, slow intake.	Not needed	Percs slowly.
Daglum	Depth to rock	Hard to pack	Not needed	Excess sodium, excess salt, slow intake.	Not needed	Excess sodium, excess salt, percs slowly.
Sc Shambo	Seepage	Piping, seepage.	Not needed	Favorable	Not needed	Favorable.
Sd Shambo	Seepage	Piping, seepage.	Floods	Floods	Not needed	Favorable.
SeA Stady	Seepage	Seepage, piping.	Not needed	Favorable	Not needed	Favorable.
Sh*:						
Lohler	Favorable	Hard to pack	Not needed	Slow intake, percs slowly, floods.	Not needed	Percs slowly.
Trembles	Seepage	Piping	Floods	Floods, soil blowing.	Piping, soil blowing.	Favorable.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ta, Tb: Trembles	Seepage	Piping	Floods	Floods, soil blowing.	Soil blowing	Favorable.
TcD*:						
Twilight	Seepage, depth to rock.	Seepage, thin layer.	Not needed	Soil blowing, rooting depth.	Soil blowing	Slope, droughty, depth to rock.
Marmarth	Seepage, depth to rock, slope.	Piping, thin layer.	Not needed	Rooting depth	Favorable	Depth to rock.
Parchin	Depth to rock	Thin layer, piping.	Not needed	Slow intake, excess sodium, rooting depth.	Percs slowly, soil blowing.	Excess sodium, percs slowly.
VaC*, VaD*:						
Vebar	Seepage, depth to rock.	Piping, seepage.	Not needed	Rooting depth, slope, soil blowing.	Soil blowing	Depth to rock.
Cohagen	Seepage, slope, depth to rock.	Thin layer, seepage, piping.	Not needed	Slope, droughty, rooting depth.	Depth to rock, slope.	Slope, rooting depth, depth to rock.
VbB*:						
Vebar	Seepage, depth to rock.	Piping	Not needed	Rooting depth, soil blowing.	Soil blowing	Depth to rock.
Tally	Seepage	Piping	Not needed	Soil blowing	Soil blowing	Favorable.
WaD: Wabek	Seepage	Seepage	Not needed	Droughty, soil blowing, slope.	Slope, too sandy, soil blowing.	Slope, droughty.
WbA: Wabek	Seepage	Seepage	Not needed	Droughty	Too sandy	Droughty.
WcA: Watrous	Seepage, depth to rock.	Thin layer	Not needed	Rooting depth	Not needed	Depth to rock, rooting depth.
YaB: Yegen	Slope, depth to rock, seepage.	Thin layer, seepage, piping.	Not needed	Favorable	Favorable	Favorable.
YaC: Yegen	Slope, depth to rock, seepage.	Thin layer, seepage, piping.	Not needed	Slope	Favorable	Slope.
Za: Zeona	Seepage	Piping, seepage.	Not needed	Fast intake, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.

* See map unit description for the composition and behavior of the map unit.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means greater than. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AaB*:											
Absher	0-2	Loam	CL	A-6, A-7	0	95-100	75-100	70-100	55-95	35-45	15-25
	2-60	Silty clay, clay, clay loam.	CL, CH	A-7	0	95-100	75-100	70-100	60-95	40-60	20-40
Loburn	0-9	Loam	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	80-100	25-40	5-15
	9-14	Silty clay, clay, silty clay loam.	CH, MH	A-7	0	100	100	90-100	75-100	50-75	20-42
	14-26	Silty clay, clay, silty clay loam.	CH	A-7	0	100	100	90-100	75-100	50-75	23-42
	26-60	Silty clay, clay, clay loam.	CL, CH	A-7	0	100	100	90-100	75-100	45-65	20-35
AbC*:											
Absher	0-2	Loam	CL	A-6, A-7	0	95-100	75-100	70-100	55-95	35-45	15-25
	2-60	Silty clay, clay, clay loam.	CL, CH	A-7	0	95-100	75-100	70-100	60-95	40-60	20-40
Slickspots.											
Ac*:											
Absher	0-2	Loam	CL	A-6, A-7	0	95-100	75-100	70-100	55-95	35-45	15-25
	2-60	Silty clay, clay, clay loam.	CL, CH	A-7	0	95-100	75-100	70-100	60-95	40-60	20-40
Trembles	0-6	Fine sandy loam	SM, ML	A-4	0	100	100	75-85	45-55	10-30	NP-5
	6-60	Sandy loam, fine sandy loam.	SM, ML	A-2, A-4	0	100	100	65-85	30-55	10-30	NP-5
Slickspots.											
AdD*:											
Amor	0-8	Loam	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	65-85	25-40	5-20
	8-34	Clay loam, loam, fine sandy loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	75-100	50-80	20-45	2-25
	34-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Cabba	0-3	Loam	CL, ML	A-4, A-6	0	100	100	95-100	60-90	20-40	10-15
	3-14	Gravelly loam, clay loam, silt loam.	GM, ML, CL	A-2, A-4, A-6	0-5	70-100	55-100	45-95	35-90	20-40	10-15
	14-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Ar Arnegard	0-11	Loam	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	60-95	25-40	3-15
	11-31	Loam, silt loam, clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	60-95	30-45	5-20
	31-60	Loam, clay loam, fine sandy loam.	SM, ML, CL, SC	A-4, A-6	0	100	100	75-95	40-80	20-40	3-15
Ba*. Badland											

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Bb-----------------Banks	0-6	Loamy fine sand	SM, SP-SM	A-2, A-4	0	100	100	60-80	10-40	<25	NP-3
	6-60	Loamy fine sand, fine sand, sandy loam.	SM, SP-SM	A-2	0	100	100	50-70	10-25	<25	NP-3
BcA*: Belfield----------	0-10	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	80-100	70-90	20-40	3-20
	10-20	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-95	50-70	30-50
	20-60	Silty clay, sandy clay loam, clay loam.	CH, CL	A-7	0	100	100	90-100	75-95	40-65	30-50
Grail-------------	0-9	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-15
	9-31	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	31-60	Silty clay loam, silt loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	80-100	30-45	5-20
BdB*: Belfield----------	0-10	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	80-100	70-90	20-40	3-20
	10-20	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-95	50-70	30-50
	20-60	Silty clay, sandy clay loam, clay loam.	CH, CL	A-7	0	100	100	90-100	75-95	40-65	30-50
Marmarth----------	0-7	Loam------------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-95	60-80	20-40	3-20
	7-25	Clay loam, loam, fine sandy loam.	ML, CL, CL-ML	A-6, A-4	0	100	100	90-100	60-80	20-40	3-20
	25-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
BeC*: Belfield----------	0-10	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	80-100	70-90	20-40	3-20
	10-20	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-95	50-70	30-50
	20-60	Silty clay, sandy clay loam, clay loam.	CH, CL	A-7	0	100	100	90-100	75-95	40-65	30-50
Morton------------	0-7	Loam------------	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-40	3-23
	7-18	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	25-50	10-30
	18-32	Loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	75-95	20-50	3-30
	32-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
BfA*:											
Belfield----------	0-10	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	80-100	70-90	20-40	3-20
	10-20	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	85-95	50-70	30-50
	20-60	Silty clay, sandy clay loam, clay loam.	CH, CL	A-7	0	100	100	90-100	75-95	40-65	30-50
Rhoades-----------	0-4	Loam------------	SM, ML, SC, CL	A-4, A-6	0	100	100	75-90	45-65	20-35	NP-15
	4-15	Clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	90-100	80-95	40-75	20-45
	15-43	Silty clay, silty clay loam.	CL, CH	A-6, A-7	0	100	100	85-100	75-95	35-70	20-40
	43-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
BhE*:											
Blackhall---------	0-13	Fine sandy loam	SM, SM-SC	A-4	0-5	90-100	90-100	65-85	40-50	10-20	NP-5
	13-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Cabbart-----------	0-6	Loam------------	CL-ML, CL	A-4	0	100	100	85-95	60-75	20-30	5-10
	6-18	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-95	20-40	5-20
	18-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
CaE*:											
Cabba-------------	0-3	Loam------------	CL, ML	A-4, A-6	0	100	100	95-100	60-90	20-40	10-15
	3-14	Gravelly loam, clay loam, silt loam.	GM, ML, CL	A-2, A-4, A-6	0-5	70-100	55-100	45-95	35-90	20-40	10-15
	14-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Lantry------------	0-26	Loam------------	ML, CL	A-4, A-6	0	100	100	90-100	75-100	17-40	5-22
	26-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
CbD*:											
Cabba-------------	0-3	Loam------------	CL, ML	A-4, A-6	0	100	100	95-100	60-90	20-40	10-15
	3-14	Gravelly loam, clay loam, silt loam.	GM, ML, CL	A-2, A-4, A-6	0-5	70-100	55-100	45-95	35-90	20-40	10-15
	14-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Trembles----------	0-6	Fine sandy loam	SM, ML	A-4	0	100	100	75-85	45-55	10-30	NP-5
	6-60	Sandy loam, fine sandy loam.	SM, ML	A-2, A-4	0	100	100	65-85	30-55	10-30	NP-5
CcD*:											
Cabba-------------	0-3	Stony loam------	CL	A-6	25-45	95-100	85-100	75-90	60-80	30-40	10-15
	3-14	Gravelly loam, clay loam, stony silt loam.	CL, SC	A-4	0-5	70-100	55-100	45-95	35-90	20-40	10-15
	14-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CcD*:											
Wayden------------	0-2	Stony silty clay loam.	CL, CH	A-6, A-7	15-50	95-100	95-100	90-100	80-100	35-55	15-30
	2-13	Stony silty clay loam, extremely stony silty clay loam.	CL, CH	A-7	15-50	95-100	95-100	90-100	80-100	40-75	20-45
	13-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
CdE*:											
Cohagen-----------	0-16	Loamy very fine sand.	SM	A-2, A-4	0	100	95-100	60-85	30-50	<25	NP-3
	16-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Vebar-------------	0-28	Fine sandy loam	SM, ML	A-4, A-2	0	100	100	60-85	30-55	15-30	NP-7
	28-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
DaB*:											
Daglum------------	0-7	Loam------------	CL, ML, CL-ML	A-4, A-6	0	100	100	75-90	60-85	20-35	3-15
	7-17	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	85-95	40-75	20-45
	17-60	Silty clay loam	CL	A-7	0	100	100	90-100	85-95	40-50	20-30
Felor-------------	0-11	Loam------------	ML, CL	A-4, A-6	0	100	100	85-95	60-75	30-40	5-15
	11-28	Sandy clay loam, clay loam.	SC, CL	A-6	0	100	100	80-95	40-75	30-40	10-20
	28-60	Silty clay, silty clay loam.	CH, ML, MH, CL	A-7	0	100	100	95-100	85-95	45-60	15-30
Db*:											
Dimmick-----------	0-60	Silty clay, clay	CH	A-7	0	100	100	90-100	75-95	50-70	25-45
Heil--------------	0-3	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	70-95	20-50	10-30
	3-48	Silty clay, clay	CH	A-7	0	100	100	90-100	75-95	50-70	25-45
	48-60	Sandy loam------	SM	A-2, A-4	0	100	100	60-70	30-40	10-30	NP-10
FaA, FaB----------- Farnuf	0-8	Loam------------	ML, CL-ML	A-4	0	90-100	90-100	75-100	55-90	25-35	NP-10
	8-16	Clay loam, loam, silty clay loam.	CL	A-6	0	90-100	85-100	80-95	65-90	25-40	10-20
	16-60	Loam, clay loam	CL	A-6	0	90-100	85-100	80-95	65-80	25-40	10-20
FbA*:											
Farnuf------------	0-8	Loam------------	ML	A-4	0	90-100	90-100	75-100	55-90	25-35	NP-10
	8-16	Clay loam, loam, silty clay loam.	CL	A-6	0	90-100	85-100	80-95	65-90	25-40	10-20
	16-60	Loam, clay loam	CL	A-6	0	90-100	85-100	80-95	65-80	25-40	10-20
Daglum------------	0-7	Loam------------	CL, ML, CL-ML	A-4, A-6	0	100	100	75-90	60-85	20-35	3-15
	7-17	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	85-95	40-75	20-45
	17-60	Silty clay loam	CL	A-7	0	100	100	90-100	85-95	40-50	20-30
FcB*, FcC*:											
Felor-------------	0-11	Loam------------	ML, CL	A-4, A-6	0	100	100	85-95	60-75	30-40	5-15
	11-28	Sandy clay loam, clay loam.	SC, CL	A-6	0	100	100	80-95	40-75	30-40	10-20
	28-60	Silty clay, silty clay loam.	CH, ML, MH, CL	A-7	0	100	100	95-100	85-95	45-60	15-30

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
FcB*, FcC*:											
Yegen	0-5	Loam	CL, ML	A-4, A-6	0	100	100	85-95	55-75	30-40	5-15
	5-26	Sandy clay loam	SM, SC	A-4, A-6	0	100	95-100	80-90	35-50	30-40	5-15
	26-51	Sandy clay loam, sandy loam.	SC, SM	A-4, A-6	0	100	95-100	60-85	35-50	30-40	5-15
	51-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Fd. Fluvaquents											
Ga Grail	0-9	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-15
	9-31	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	31-60	Silty clay loam, silt loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	80-100	30-45	5-20
LaA, LaB, LaC Lawther	0-60	Silty clay, clay	CL, CH	A-7	0	100	100	90-100	80-95	45-70	25-40
LbB Lefor	0-7	Fine sandy loam	SM, ML	A-4	0	100	100	70-85	40-55	15-25	NP-5
	7-29	Sandy clay loam, loam, clay loam.	SC, CL	A-6	0	100	100	80-90	35-55	20-40	10-25
	29-37	Fine sandy loam	SM, ML	A-4	0	100	100	70-85	40-55	15-25	NP-5
	37-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
MaB Manning	0-4	Fine sandy loam	SM	A-2, A-4	0	95-100	95-100	60-85	30-50	20-30	NP-7
	4-26	Sandy loam, fine sandy loam, loam.	SM, ML, CL, SC	A-2, A-4, A-6	0-3	85-100	80-100	60-95	30-70	<35	NP-15
	26-60	Sand and gravel	GM, SM, GP-GM, SP-SM	A-1, A-2	0-5	25-75	15-65	10-40	5-35	<25	NP-5
MbB Marmarth	0-7	Loam	ML, CL, CL-ML	A-4, A-6	0	100	100	85-95	60-80	20-40	3-20
	7-25	Clay loam, loam, fine sandy loam.	ML, CL, CL-ML	A-6, A-4	0	100	100	90-100	60-80	20-40	3-20
	25-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
McA, McB, McC Morton	0-7	Loam	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-40	3-23
	7-18	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	25-50	10-30
	18-32	Loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	75-95	20-50	3-30
	32-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
MdC*, MdD*:											
Morton	0-7	Loam	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-40	3-23
	7-18	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	25-50	10-30
	18-32	Loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	75-95	20-50	3-30
	32-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MdC*, MdD*:											
Lantry------------	0-26	Loam------------	ML, CL	A-4, A-6	0	100	100	90-100	75-100	17-40	5-22
	26-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
MeD*:											
Morton------------	0-7	Loam------------	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-40	3-23
	7-18	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	25-50	10-30
	18-32	Loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	75-95	20-50	3-30
	32-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rhoades-----------	0-4	Loam------------	SM, ML, SC, CL	A-4, A-6	0	100	100	75-90	45-65	20-35	NP-15
	4-15	Clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	90-100	80-95	40-75	20-45
	15-43	Silty clay, silty clay loam.	CL, CH	A-6, A-7	0	100	100	85-100	75-95	35-70	20-40
	43-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Pa---------------- Parshall	0-24	Fine sandy loam	SM, ML	A-4, A-2	0	100	100	60-85	30-55	20-30	NP-7
	24-60	Fine sandy loam, sandy loam, loamy sand.	SM, ML	A-4, A-2	0	100	100	60-85	30-55	20-30	NP-7
Pb. Psamments											
RaA, RaC----------- Reeder	0-5	Loam------------	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-85	20-40	5-20
	5-32	Clay loam, loam	CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	60-80	25-50	5-30
	32-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
RbB*:											
Reeder------------	0-5	Loam------------	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-85	20-40	5-20
	5-32	Clay loam, loam	CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	60-80	25-50	5-30
	32-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Amor--------------	0-8	Loam------------	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	65-85	25-40	5-20
	8-34	Clay loam, loam, fine sandy loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	75-100	50-80	20-45	2-25
	34-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
RcC*:											
Reeder------------	0-5	Loam------------	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-85	20-40	5-20
	5-32	Clay loam, loam	CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	60-80	25-50	5-30
	32-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Lantry------------	0-26	Loam------------	ML, CL	A-4, A-6	0	100	100	90-100	75-100	17-40	5-22
	26-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
RdB*:											
Reeder------------	0-5	Loam------------	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-85	20-40	5-20
	5-32	Clay loam, loam	CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	60-80	25-50	5-30
	32-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rhoades-----------	0-4	Loam------------	SM, ML, SC, CL	A-4, A-6	0	100	100	75-90	45-65	20-35	NP-15
	4-15	Clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	90-100	80-95	40-75	20-45
	15-43	Silty clay, silty clay loam.	CL, CH	A-6, A-7	0	100	100	85-100	75-95	35-70	20-40
	43-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
ReB*:											
Regent------------	0-35	Silty clay loam	CL, CH	A-6, A-7	0	100	100	90-100	85-95	30-70	15-45
	35-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Daglum------------	0-7	Loam------------	CL, ML, CL-ML	A-4, A-6	0	100	100	75-90	60-85	20-35	3-15
	7-17	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	85-95	40-75	20-45
	17-60	Silty clay loam	CL	A-7	0	100	100	90-100	85-95	40-50	20-30
RfB*:											
Regent------------	0-35	Silty clay loam	CL, CH	A-6, A-7	0	100	100	90-100	85-95	30-70	15-45
	35-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Savage------------	0-5	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-25
	5-22	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-40
	22-60	Silty clay, clay loam, clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-40
RhD*:											
Regent------------	0-35	Silty clay loam	CL, CH	A-6, A-7	0	100	100	90-100	85-95	30-70	15-45
	35-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Wayden------------	0-13	Silty clay loam	CH, CL	A-7	0	100	100	90-100	85-95	40-75	20-50
	13-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
RkD*:											
Rhoades-----------	0-4	Loam------------	CL	A-6, A-7	0	100	100	90-100	70-85	30-45	10-25
	4-15	Clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	90-100	80-95	40-75	20-45
	15-43	Silty clay, silty clay loam.	CL, CH	A-6, A-7	0	100	100	85-100	75-95	35-70	20-40
	43-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Cabba-------------	0-3	Loam------------	CL, ML	A-4, A-6	0	100	100	95-100	60-90	20-40	10-15
	3-14	Gravelly loam, clay loam, silt loam.	GM, ML, CL	A-2, A-4, A-6	0-5	70-100	55-100	45-95	35-90	20-40	10-15
	14-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
RmC*:											
Rhoades-----------	0-4	Loam------------	CL	A-6, A-7	0	100	100	90-100	70-85	30-45	10-25
	4-15	Clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	90-100	80-95	40-75	20-45
	15-43	Silty clay, silty clay loam.	CL, CH	A-6, A-7	0	100	100	85-100	75-95	35-70	20-40
	43-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Daglum------------	0-7	Loam------------	CL, ML, CL-ML	A-4, A-6	0	100	100	75-90	60-85	20-35	3-15
	7-17	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	85-95	40-75	20-45
	17-60	Silty clay loam	CL	A-7	0	100	100	90-100	85-95	40-50	20-30
Slickspots.											
RnD*:											
Rhoades-----------	0-4	Loam------------	CL	A-6, A-7	0	100	100	90-100	70-85	30-45	10-25
	4-15	Clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	90-100	80-95	40-75	20-45
	15-43	Silty clay, silty clay loam.	CL, CH	A-6, A-7	0	100	100	85-100	75-95	35-70	20-40
	43-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
RoE*:											
Rock outcrop.											
Cabba-------------	0-3	Loam------------	CL, ML	A-4, A-6	0-45	95-100	85-100	75-90	60-80	20-40	10-15
	3-14	Gravelly loam, clay loam, silt loam.	GM, ML, CL	A-2, A-4, A-6	0-5	70-100	55-100	45-95	35-90	20-40	10-15
	14-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
SaA---------------- Savage	0-5	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-25
	5-22	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-40
	22-60	Silty clay, clay loam, clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-40
SbA*:											
Savage------------	0-5	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-25
	5-22	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-40
	22-60	Silty clay, clay loam, clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-40
Daglum------------	0-7	Loam------------	CL, ML, CL-ML	A-4, A-6	0	100	100	75-90	60-85	20-35	3-15
	7-17	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	85-95	40-75	20-45
	17-60	Silty clay loam	CL	A-7	0	100	100	90-100	85-95	40-50	20-30

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Sc----------------- Shambo	0-8	Loam------------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	25-35	3-13
	8-19	Loam, silt loam, clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	25-40	3-18
	19-42	Stratified loam to silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	25-40	3-18
	42-60	Gravelly sandy loam.	SM, SM-SC	A-2, A-4	0	85-100	80-90	60-70	30-40	15-25	NP-5
Sd----------------- Shambo	0-31	Loam------------	CL, CL-ML	A-4, A-6	0	100	95-100	75-100	60-85	20-40	5-20
	31-60	Stratified loam to loamy fine sand.	ML, CL, SM, SC	A-2, A-4	0	90-100	85-100	50-90	30-75	<30	NP-10
SeA---------------- Stady	0-6	Loam------------	ML, CL, CL-ML	A-4, A-6	0-1	95-100	95-100	85-95	60-75	25-40	3-15
	6-10	Loam------------	ML, CL, CL-ML	A-4, A-6	0-1	95-100	95-100	85-95	60-75	25-40	3-15
	10-24	Loam, clay loam	ML, CL, CL-ML	A-4, A-6	0-1	95-100	95-100	85-95	60-75	25-40	3-15
	24-60	Sand and gravel	SM, SP, GM, GP	A-1	0-1	50-100	50-95	10-30	2-15	---	NP
Sh*: Lohler------------	0-60	Clay, clay loam	CH, CL	A-7	0	100	100	90-100	75-100	45-70	25-50
Trembles----------	0-6	Fine sandy loam	SM, ML	A-4	0	100	100	75-85	45-55	10-30	NP-5
	6-60	Sandy loam, fine sandy loam.	SM, ML	A-2, A-4	0	100	100	65-85	30-55	10-30	NP-5
Ta, Tb------------- Trembles	0-6	Fine sandy loam	SM, ML	A-4	0	100	100	75-85	45-55	10-30	NP-5
	6-60	Sandy loam, fine sandy loam.	SM, ML	A-2, A-4	0	100	100	65-85	30-55	10-30	NP-5
TcD*: Twilight----------	0-34	Fine sandy loam	SM, SM-SC	A-4	0	100	100	60-90	35-50	20-30	NP-5
	34-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Marmarth----------	0-7	Loam------------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-95	60-80	20-40	3-20
	7-25	Clay loam, loam, fine sandy loam.	ML, CL, CL-ML	A-6, A-4	0	100	100	90-100	60-80	20-40	3-20
	25-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Parchin-----------	0-10	Loamy fine sand	SM, SM-SC	A-4, A-2	0	100	100	90-100	15-50	<25	NP-5
	10-18	Sandy clay loam, loam.	SC, SM, CL, ML	A-4, A-6	0	100	100	90-100	35-60	30-40	5-15
	18-27	Fine sandy loam, loam, sandy clay loam.	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	40-60	20-35	NP-10
	27-60	Weathered bedrock.	SM, SM-SC	A-2, A-4	0	100	100	90-100	15-45	<30	NP-5
VaC*, VaD*: Vebar-------------	0-28	Fine sandy loam	SM, ML	A-4, A-2	0	100	100	60-85	30-55	20-30	NP-7
	28-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Cohagen-----------	0-16	Fine sandy loam	SM	A-2, A-4	0	100	95-100	60-85	30-50	20-30	NP-7
	16-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
VbB*:											
Vebar-------------	0-28	Fine sandy loam	SM, ML	A-4, A-2	0	100	100	60-85	30-55	20-30	NP-7
	28-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Tally-------------	0-7	Fine sandy loam	SM, ML	A-4	0	100	100	70-85	40-55	20-30	NP-7
	7-36	Fine sandy loam, sandy loam.	SM, ML	A-4	0	100	100	65-80	35-55	20-30	NP-7
	36-60	Loamy fine sand, fine sand.	SM	A-2	0	100	100	55-80	15-35	<25	NP-5
WaD---------------- Wabek	0-5	Sandy loam------	SM	A-2, A-4	0-1	85-100	85-100	60-70	30-40	20-30	NP-5
	5-12	Gravelly sandy loam, gravelly loam, gravelly coarse sandy loam.	SM, GM	A-2, A-4	0-1	50-100	50-95	50-65	20-40	<25	NP-5
	12-60	Very gravelly coarse sand, gravelly loamy coarse sand, sand.	SM, SP, GM, GP	A-1, A-2	0-1	50-100	50-95	10-40	2-35	<25	NP-5
WbA---------------- Wabek	0-5	Very gravelly loamy sand.	SP, SM, GM, GP	A-1, A-2	0-1	90-100	50-95	10-40	2-35	<25	NP-5
	5-60	Very gravelly coarse sand, gravelly loamy coarse sand, sand.	SM, SP, GM, GP	A-1, A-2	0-1	50-100	50-95	10-40	2-35	<25	NP-5
WcA---------------- Watrous	0-5	Loam------------	CL, CL-ML	A-4, A-6	0	100	100	85-95	60-80	20-40	5-20
	5-14	Loam, clay loam	CL	A-6, A-7	0-5	90-100	85-100	80-100	60-80	25-45	10-30
	14-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
YaB---------------- Yegen	0-5	Loam------------	CL, ML	A-4, A-6	0	100	100	85-95	55-75	30-40	5-15
	5-26	Sandy clay loam	SM, SC	A-4, A-6	0	100	95-100	80-90	35-50	30-40	5-15
	26-51	Sandy clay loam, sandy loam.	SC, SM	A-4, A-6	0	100	95-100	60-85	35-50	30-40	5-15
	51-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
YaC---------------- Yegen	0-5	Sandy loam------	SM	A-4	0	100	95-100	60-70	35-45	20-30	NP-7
	5-26	Sandy clay loam	SM, SC	A-4, A-6	0	100	95-100	80-90	35-50	30-40	5-15
	26-51	Sandy clay loam, sandy loam.	SC, SM	A-4, A-6	0	100	95-100	60-85	35-50	30-40	5-15
	51-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Za----------------- Zeona	0-60	Loamy fine sand	SM, SP-SM	A-2	0	100	100	75-95	10-35	<25	NP-5

* See map unit description for the composition and behavior of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means greater then. The erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not available or were not estimated]

Soil name and map symbol	Depth	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Risk of corrosion		Erosion factors		Wind erodi- bility group
							Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH	Mmhos/cm						
AaB*:											
Absher	0-2	<0.06	0.14-0.18	6.6-8.4	4-8	High	High	Moderate	0.28	1	6
	2-60	<0.06	0.12-0.16	7.4-9.0	4-16	High	High	Moderate	0.28		
Loburn	0-9	0.6-2.0	0.18-0.21	5.6-7.3	<2	Low	Moderate	Low	0.37	3	6
	9-14	<0.06	0.07-0.13	6.1-7.8	4-16	High	High	Moderate	0.37		
	14-26	<0.06	0.07-0.13	7.4-8.4	4-16	High	High	Moderate	0.37		
	26-60	<0.2	0.07-0.13	7.4-8.4	8-16	High	High	High	0.37		
AbC*:											
Absher	0-2	<0.06	0.14-0.18	6.6-8.4	4-8	High	High	Moderate	0.28	1	6
	2-60	<0.06	0.12-0.16	7.4-9.0	4-16	High	High	Moderate	0.28		
Slickspots.											
Ac*:											
Absher	0-2	<0.06	0.14-0.18	6.6-8.4	4-8	High	High	Moderate	0.28	1	6
	2-60	<0.06	0.12-0.16	7.4-9.0	4-16	High	High	Moderate	0.28		
Trembles	0-6	2.0-6.0	0.10-0.16	6.6-7.8	<2	Low	High	Low	0.20	5	3
	6-60	2.0-6.0	0.10-0.16	7.4-8.4	<2	Low	High	Low	0.20		
Slickspots.											
AdD*:											
Amor	0-8	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	High	Low	0.28	4-3	6
	8-34	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	High	Low	0.28		
	34-60	---	---	---	---				---		
Cabba	0-3	0.6-2.0	0.15-0.22	6.6-7.8	<4	Moderate	High	Low	0.37	2	4L
	3-14	0.6-2.0	0.12-0.19	7.9-8.4	2-8	Moderate	High	Low	0.37		
	14-60	---	---	---	---				---		
Ar: Arnegard	0-11	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	High	Low	0.28	5	6
	11-31	0.6-2.0	0.17-0.21	6.6-7.3	<2	Moderate	High	Low	0.28		
	31-60	0.6-2.0	0.13-0.19	7.4-8.4	<2	Moderate	High	Low	0.28		
Ba*. Badland											
Bb: Banks	0-6	6.0-20.	0.06-0.09	6.6-7.8	<2	Low	Moderate	Low	0.17	5	2
	6-60	6.0-20.	0.07-0.09	7.4-8.4	<2	Low	Moderate	Low	0.17		
BcA*:											
Belfield	0-10	0.2-2.0	0.20-0.23	6.1-7.3	<2	Moderate	High	Low	0.32	5-4	6
	10-20	0.2-0.6	0.14-0.18	6.6-7.8	<2	High	High	Moderate	0.32		
	20-60	0.06-0.6	0.13-0.16	7.9-9.0	4-16	High	High	Low	0.32		
Grail	0-9	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	High	Low	0.32	5	6
	9-31	0.2-0.6	0.13-0.18	6.6-7.3	<2	High	High	Low	0.32		
	31-60	0.2-0.6	0.14-0.22	7.4-8.4	<2	Moderate	High	Low	0.32		
BdB*:											
Belfield	0-10	0.2-2.0	0.20-0.23	6.1-7.3	<2	Moderate	High	Low	0.32	5-4	6
	10-20	0.2-0.6	0.14-0.18	6.6-7.8	<2	High	High	Moderate	0.32		
	20-60	0.06-0.6	0.13-0.16	7.9-9.0	4-16	High	High	Low	0.32		
Marmarth	0-7	0.6-2.0	0.20-0.22	6.1-7.3	<2	Moderate	High	Low	0.28	4-3	6
	7-25	0.6-2.0	0.14-0.18	6.6-8.4	<2	Moderate	High	Low	0.28		
	25-60	---	---	---	---				---		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm						
BeC*:											
Belfield----------	0-10	0.2-2.0	0.20-0.23	6.1-7.3	<2	Moderate	High-----	Low------	0.32	5-4	6
	10-20	0.2-0.6	0.14-0.18	6.6-7.8	<2	High------	High-----	Moderate	0.32		
	20-60	0.06-0.6	0.13-0.16	7.9-9.0	4-16	High------	High-----	Low------	0.32		
Morton------------	0-7	0.6-2.0	0.22-0.24	6.6-7.3	<2	Low-------	Moderate	Low------	0.32	4-3	6
	7-18	0.6-2.0	0.16-0.20	6.6-7.8	<2	Moderate	Moderate	Low------	0.43		
	18-32	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	Moderate	Low------	0.43		
	32-60	---	---	---	---	---------	---------	---------	---		
BfA*:											
Belfield----------	0-10	0.2-2.0	0.20-0.23	6.1-7.3	<2	Moderate	High-----	Low------	0.32	5-4	6
	10-20	0.2-0.6	0.14-0.18	6.6-7.8	<2	High------	High-----	Moderate	0.32		
	20-60	0.06-0.6	0.13-0.16	7.9-9.0	4-16	High------	High-----	Low------	0.32		
Rhoades-----------	0-4	0.6-6.0	0.13-0.15	6.1-7.3	<2	Low-------	Moderate	Low------	0.32	3	6
	4-15	<0.2	0.10-0.12	7.4-9.0	2-16	High------	High-----	Moderate	0.32		
	15-43	<0.2	0.10-0.12	7.9-9.0	8-16	High------	High-----	Moderate	0.32		
	43-60	---	---	---	---	---------	---------	---------	---		
BhE*:											
Blackhall---------	0-13	0.6-2.0	0.13-0.15	7.9-8.4	<2	Low-------	High-----	Moderate	0.32	2	3
	13-60	---	---	---	---	---------	---------	---------	---		
Cabbart-----------	0-6	0.6-2.0	0.14-0.20	7.4-8.4	2-4	Low-------	High-----	Moderate	0.37	2	4L
	6-18	0.06-0.6	0.12-0.18	7.4-9.0	2-8	Moderate	High-----	Moderate	0.37		
	18-60	---	---	---	---	---------	---------	---------	---		
CaE*:											
Cabba-------------	0-3	0.6-2.0	0.15-0.22	6.6-7.8	<4	Moderate	High-----	Low------	0.37	2	4L
	3-14	0.6-2.0	0.12-0.19	7.9-8.4	2-8	Moderate	High-----	Low------	0.37		
	14-60	---	---	---	---	---------	---------	---------	---		
Lantry------------	0-26	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	High-----	Low------	0.43	4	4L
	26-60	---	---	---	---	---------	---------	---------	---		
CbD*:											
Cabba-------------	0-3	0.6-2.0	0.15-0.22	6.6-7.8	<4	Moderate	High-----	Low------	0.37	2	4L
	3-14	0.6-2.0	0.12-0.19	7.9-8.4	2-8	Moderate	High-----	Low------	0.37		
	14-60	---	---	---	---	---------	---------	---------	---		
Trembles----------	0-6	2.0-6.0	0.10-0.16	6.6-7.8	<2	Low-------	High-----	Low------	0.20	5	3
	6-60	2.0-6.0	0.10-0.16	7.4-8.4	<2	Low-------	High-----	Low------	0.20		
CcD*:											
Cabba-------------	0-3	0.6-2.0	0.12-0.15	6.6-7.8	<4	Moderate	High-----	Low------	0.37	2	4L
	3-14	0.6-2.0	0.12-0.19	7.9-8.4	2-8	Moderate	High-----	Low------	0.37		
	14-60	---	---	---	---	---------	---------	---------	---		
Wayden------------	0-2	0.06-0.2	0.14-0.17	7.4-8.4	<2	High------	High-----	Moderate	0.32	2	7
	2-13	0.06-0.2	0.14-0.17	7.4-8.4	<2	High------	High-----	Moderate	0.32		
	13-60	---	---	---	---	---------	---------	---------	---		
CdE*:											
Cohagen-----------	0-16	2.0-6.0	0.13-0.18	6.6-8.4	<2	Low-------	Moderate	Low------	0.24	2	2
	16-60	---	---	---	---	---------	---------	---------	---		
Vebar-------------	0-28	2.0-6.0	0.15-0.17	6.1-7.8	<2	Low-------	Moderate	Low------	0.20	4	3
	28-60	---	---	---	---	---------	---------	---------	---		
DaB*:											
Daglum------------	0-7	0.6-6.0	0.13-0.15	6.1-7.3	<2	Low-------	High-----	Low------	0.32	3	6
	7-17	<0.2	0.12-0.14	6.6-9.0	2-8	High------	High-----	Moderate	0.32		
	17-60	<0.2	0.12-0.14	7.9-9.0	8-16	High------	High-----	Moderate	0.32		
Felor-------------	0-11	0.6-2.0	0.18-0.20	6.1-7.3	<2	Moderate	Moderate	Low------	0.28	4	6
	11-28	0.6-2.0	0.16-0.18	6.1-7.3	<2	Moderate	High-----	Low------	0.28		
	28-60	0.06-0.2	0.11-0.17	7.4-8.4	<2	High------	High-----	Low------	0.28		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Risk of corrosion		Erosion factors		Wind erodi- bility group
							Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH	Mmhos/cm						
Db*:											
Dimmick-----------	0-60	<0.06	0.13-0.18	6.6-7.8	<2	High------	High-----	Low------	0.28	5	8
Heil--------------	0-3	<0.06	0.15-0.24	6.1-7.3	<2	Moderate	High-----	Moderate	0.28	4	8
	3-48	<0.06	0.13-0.18	6.6-9.0	4-12	High------	High-----	Moderate	0.28		
	48-60	2.0-6.0	0.09-0.13	7.9-9.0	4-12	Low-------	High-----	Moderate	0.20		
FaA, FaB----------- Farnuf	0-8	0.6-2.0	0.15-0.20	6.1-7.8	<2	Low-------	High-----	Low------	0.32	5	6
	8-16	0.6-2.0	0.14-0.20	6.1-7.8	<2	Moderate	High-----	Low------	0.32		
	16-60	0.6-2.0	0.14-0.20	7.4-8.4	<2	Moderate	High-----	Low------	0.32		
FbA*:											
Farnuf------------	0-8	0.6-2.0	0.15-0.20	6.1-7.8	<2	Low-------	High-----	Low------	0.32	5	6
	8-16	0.6-2.0	0.14-0.20	6.1-7.8	<2	Moderate	High-----	Low------	0.32		
	16-60	0.6-2.0	0.14-0.20	7.4-8.4	<2	Moderate	High-----	Low------	0.32		
Daglum------------	0-7	0.6-6.0	0.13-0.15	6.1-7.3	<2	Low-------	High-----	Low------	0.32	3	6
	7-17	<0.2	0.12-0.14	6.6-9.0	2-8	High------	High-----	Moderate	0.32		
	17-60	<0.2	0.12-0.14	7.9-9.0	8-16	High------	High-----	Moderate	0.32		
FcB*, FcC*:											
Felor-------------	0-11	0.6-2.0	0.18-0.20	6.1-7.3	<2	Moderate	Moderate	Low------	0.28	4	6
	11-28	0.6-2.0	0.16-0.18	6.1-7.3	<2	Moderate	High-----	Low------	0.28		
	28-60	0.06-0.2	0.11-0.17	7.4-8.4	<2	High------	High-----	Low------	0.28		
Yegen-------------	0-5	0.6-2.0	0.18-0.20	6.1-7.3	<2	Low-------	Moderate	Low------	0.28	4	5
	5-26	0.6-2.0	0.17-0.19	6.1-7.3	<2	Moderate	High-----	Low------	0.32		
	26-51	0.6-6.0	0.10-0.17	6.6-7.8	<2	Low-------	High-----	Low------	0.32		
	51-60	---	---	---	---	---------	---------	---------	---		
Fd. Fluvaquents											
Ga---------------- Grail	0-9	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	High-----	Low------	0.32	5	6
	9-31	0.2-0.6	0.13-0.18	6.6-7.3	<2	High------	High-----	Low------	0.32		
	31-60	0.2-0.6	0.14-0.22	7.4-8.4	<2	Moderate	High-----	Low------	0.32		
LaA, LaB, LaC------ Lawther	0-60	0.06-0.2	0.14-0.17	7.4-9.0	<8	High------	High-----	Moderate	0.32	5	4
LbB---------------- Lefor	0-7	2.0-6.0	0.16-0.18	6.6-7.3	<2	Low-------	Moderate	Low------	0.20	4-3	3
	7-29	0.6-2.0	0.15-0.17	6.6-8.4	<2	Moderate	Moderate	Low------	0.32		
	29-37	0.6-2.0	0.15-0.17	7.4-8.4	<2	Low-------	Moderate	Low------	0.32		
	37-60	---	---	---	---	---------	---------	---------	---		
MaB---------------- Manning	0-4	2.0-6.0	0.13-0.18	6.6-7.3	<2	Low-------	Moderate	Low------	0.20	4	3
	4-26	2.0-6.0	0.12-0.20	6.6-8.4	<2	Low-------	Moderate	Low------	0.20		
	26-60	6.0-20.0	0.02-0.08	7.9-8.4	<2	Low-------	Moderate	Low------	0.10		
MbB---------------- Marmarth	0-7	0.6-2.0	0.20-0.22	6.1-7.3	<2	Moderate	High-----	Low------	0.28	4-3	6
	7-25	0.6-2.0	0.14-0.18	6.6-8.4	<2	Moderate	High-----	Low------	0.28		
	25-60	---	---	---	---	---------	---------	---------	---		
McA, McB, McC------ Morton	0-7	0.6-2.0	0.22-0.24	6.6-7.3	<2	Low-------	Moderate	Low------	0.32	4-3	6
	7-18	0.6-2.0	0.16-0.20	6.6-7.8	<2	Moderate	Moderate	Low------	0.43		
	18-32	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	Moderate	Low------	0.43		
	32-60	---	---	---	---	---------	---------	---------	---		
MdC*, MdD*:											
Morton------------	0-7	0.6-2.0	0.22-0.24	6.6-7.3	<2	Low-------	Moderate	Low------	0.32	4-3	6
	7-18	0.6-2.0	0.16-0.20	6.6-7.8	<2	Moderate	Moderate	Low------	0.43		
	18-32	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	Moderate	Low------	0.43		
	32-60	---	---	---	---	---------	---------	---------	---		
Lantry------------	0-26	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	High-----	Low------	0.43	4	4L
	26-60	---	---	---	---	---------	---------	---------	---		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm						
MeD*:											
Morton	0-7	0.6-2.0	0.22-0.24	6.6-7.3	<2	Low	Moderate	Low	0.32	4-3	6
	7-18	0.6-2.0	0.16-0.20	6.6-7.8	<2	Moderate	Moderate	Low	0.43		
	18-32	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	Moderate	Low	0.43		
	32-60	---	---	---	---	---	---	---	---		
Rhoades	0-4	0.6-6.0	0.13-0.15	6.1-7.3	<2	Low	Moderate	Low	0.32	3	6
	4-15	<0.2	0.10-0.12	7.4-9.0	2-16	High	High	Moderate	0.32		
	15-43	<0.2	0.10-0.12	7.9-9.0	8-16	High	High	Moderate	0.32		
	43-60	---	---	---	---	---	---	---	---		
Pa: Parshall	0-24	2.0-6.0	0.16-0.18	6.6-7.3	<2	Low	Moderate	Low	0.20	5	3
	24-60	2.0-6.0	0.12-0.17	6.6-8.4	<2	Low	Moderate	Low	0.20		
Pb. Psamments											
RaA, RaC: Reeder	0-5	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	High	Low	0.28	4-3	6
	5-32	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	High	Low	0.28		
	32-60	---	---	---	---	---	---	---	---		
RbB*:											
Reeder	0-5	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	High	Low	0.28	4-3	6
	5-32	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	High	Low	0.28		
	32-60	---	---	---	---	---	---	---	---		
Amor	0-8	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	High	Low	0.28	4-3	6
	8-34	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	High	Low	0.28		
	34-60	---	---	---	---	---	---	---	---		
RcC*:											
Reeder	0-5	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	High	Low	0.28	4-3	6
	5-32	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	High	Low	0.28		
	32-60	---	---	---	---	---	---	---	---		
Lantry	0-26	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	High	Low	0.43	4	4L
	26-60	---	---	---	---	---	---	---	---		
RdB*:											
Reeder	0-5	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	High	Low	0.28	4-3	6
	5-32	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	High	Low	0.28		
	32-60	---	---	---	---	---	---	---	---		
Rhoades	0-4	0.6-6.0	0.13-0.15	6.1-7.3	<2	Low	Moderate	Low	0.32	3	6
	4-15	<0.2	0.10-0.12	7.4-9.0	2-16	High	High	Moderate	0.32		
	15-43	<0.2	0.10-0.12	7.9-9.0	8-16	High	High	Moderate	0.32		
	43-60	---	---	---	---	---	---	---	---		
ReB*:											
Regent	0-35	0.06-0.2	0.17-0.20	6.1-8.4	0-8	High	High	Moderate	0.32	4	7
	35-60	---	---	---	---	---	---	---	---		
Daglum	0-7	0.6-6.0	0.13-0.15	6.1-7.3	<2	Low	High	Low	0.32	3	6
	7-17	<0.2	0.12-0.14	6.6-9.0	2-8	High	High	Moderate	0.32		
	17-60	<0.2	0.12-0.14	7.9-9.0	8-16	High	High	Moderate	0.32		
RfB*:											
Regent	0-35	0.06-0.2	0.17-0.20	6.1-8.4	0-8	High	High	Moderate	0.32	4	7
	35-60	---	---	---	---	---	---	---	---		
Savage	0-5	0.6-2.0	0.14-0.20	6.6-7.8	<2	Moderate	High	Low	0.37	5	7
	5-22	0.2-0.6	0.16-0.20	7.4-7.8	2-8	High	High	Low	0.37		
	22-60	0.2-0.6	0.16-0.20	7.4-8.4	2-8	High	High	Low	0.37		
RhD*:											
Regent	0-35	0.06-0.2	0.17-0.20	6.1-8.4	0-8	High	High	Moderate	0.32	4	7
	35-60	---	---	---	---	---	---	---	---		
Wayden	0-13	0.06-0.2	0.14-0.19	7.4-8.4	<8	High	High	Moderate	0.32	2	4L
	13-60	---	---	---	---	---	---	---	---		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodi-bility group
	In	In/hr	In/in	pH	Mmhos/cm						
RkD*:											
Rhoades	0-4	0.6-2.0	0.15-0.17	6.1-7.3	<2	Moderate	High	Low	0.32	3	6
	4-15	<0.2	0.10-0.12	7.4-9.0	2-16	High	High	Moderate	0.32		
	15-43	<0.2	0.10-0.12	7.9-9.0	8-16	High	High	Moderate	0.32		
	43-60	---	---	---	---	---	---	---	---		
Cabba	0-3	0.6-2.0	0.15-0.22	6.6-7.8	<4	Moderate	High	Low	0.37	2	4L
	3-14	0.6-2.0	0.12-0.19	7.9-8.4	2-8	Moderate	High	Low	0.37		
	14-60	---	---	---	---	---	---	---	---		
RmC*:											
Rhoades	0-4	0.6-2.0	0.15-0.17	6.1-7.3	<2	Moderate	High	Low	0.32	3	6
	4-15	<0.2	0.10-0.12	7.4-9.0	2-16	High	High	Moderate	0.32		
	15-43	<0.2	0.10-0.12	7.9-9.0	8-16	High	High	Moderate	0.32		
	43-60	---	---	---	---	---	---	---	---		
Daglum	0-7	0.6-6.0	0.13-0.15	6.1-7.3	<2	Low	High	Low	0.32	3	6
	7-17	<0.2	0.12-0.14	6.6-9.0	2-8	High	High	Moderate	0.32		
	17-60	<0.2	0.12-0.14	7.9-9.0	8-16	High	High	Moderate	0.32		
Slickspots.											
RnD*:											
Rhoades	0-4	0.6-2.0	0.15-0.17	6.1-7.3	<2	Moderate	High	Low	0.32	3	6
	4-15	<0.2	0.10-0.12	7.4-9.0	2-16	High	High	Moderate	0.32		
	15-43	<0.2	0.10-0.12	7.9-9.0	8-16	High	High	Moderate	0.32		
	43-60	---	---	---	---	---	---	---	---		
Rock outcrop.											
RoE*:											
Rock outcrop.											
Cabba	0-3	0.6-2.0	0.12-0.15	6.6-7.8	<4	Moderate	High	Low	0.37	2	4L
	3-14	0.6-2.0	0.12-0.19	7.9-8.4	2-8	Moderate	High	Low	0.37		
	14-60	---	---	---	---	---	---	---	---		
SaA	0-5	0.6-2.0	0.14-0.20	6.6-7.8	<2	Moderate	High	Low	0.37	5	7
Savage	5-22	0.2-0.6	0.16-0.20	7.4-7.8	2-8	High	High	Low	0.37		
	22-60	0.2-0.6	0.16-0.20	7.4-8.4	2-8	High	High	Low	0.37		
SbA*:											
Savage	0-5	0.6-2.0	0.14-0.20	6.6-7.8	<2	Moderate	High	Low	0.37	5	7
	5-22	0.2-0.6	0.16-0.20	7.4-7.8	2-8	High	High	Low	0.37		
	22-60	0.2-0.6	0.16-0.20	7.4-8.4	2-8	High	High	Low	0.37		
Daglum	0-7	0.6-6.0	0.13-0.15	6.1-7.3	<2	Low	High	Low	0.32	3	6
	7-17	<0.2	0.12-0.14	6.6-9.0	2-8	High	High	Moderate	0.32		
	17-60	<0.2	0.12-0.14	7.9-9.0	8-16	High	High	Moderate	0.32		
Sc	0-8	0.6-2.0	0.20-0.22	6.6-7.3	<2	Moderate	Moderate	Low	0.28	5	6
Shambo	8-19	0.6-2.0	0.17-0.19	6.6-8.4	<2	Moderate	Moderate	Low	0.28		
	19-42	0.6-2.0	0.17-0.19	7.4-8.4	<2	Moderate	Moderate	Low	0.28		
	42-60	2.0-6.0	0.11-0.13	7.4-8.4	<2	Low	Moderate	Low	0.15		
Sd	0-31	0.6-2.0	0.18-0.20	6.6-7.8	<2	Low	Moderate	Low	0.28	5	6
Shambo	31-60	2.0-6.0	0.08-0.18	7.4-8.4	<2	Low	High	Low	0.28		
SeA	0-6	0.6-2.0	0.20-0.22	6.6-7.3	<2	Low	Moderate	Low	0.28	4	6
Stady	6-10	0.6-2.0	0.17-0.19	6.6-7.3	<2	Low	Moderate	Low	0.28		
	10-24	0.6-2.0	0.17-0.19	7.4-8.4	<2	Low	Moderate	Low	0.28		
	24-60	6.0-20.0	0.02-0.04	7.4-8.4	<2	Low	Moderate	Low	0.10		
Sh*:											
Lohler	0-60	0.06-0.2	0.13-0.16	6.6-8.4	<2	High	High	Low	0.37	5	4
Trembles	0-6	2.0-6.0	0.10-0.16	6.6-7.8	<2	Low	High	Low	0.20	5	3
	6-60	2.0-6.0	0.10-0.16	7.4-8.4	<2	Low	High	Low	0.20		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Risk of corrosion		Erosion factors		Wind erodi- bility group
							Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH	Mmhos/cm						
Ta, Tb: Trembles	0-6	2.0-6.0	0.10-0.16	6.6-7.8	<2	Low	High	Low	0.20	5	3
	6-60	2.0-6.0	0.10-0.16	7.4-8.4	<2	Low	High	Low	0.20		
TcD*:											
Twilight	0-34	0.6-6.0	0.09-0.13	6.6-7.8	<2	Low	Moderate	Low	0.24	4	3
	34-60	---	---	7.4-8.4	---	---	---	---	---		
Marmarth	0-7	0.6-2.0	0.20-0.22	6.1-7.3	<2	Moderate	High	Low	0.28	4-3	6
	7-25	0.6-2.0	0.14-0.18	6.6-8.4	<2	Moderate	High	Low	0.28		
	25-60	---	---	---	---	---	---	---	---		
Parchin	0-10	2.0-6.0	0.13-0.16	5.1-7.3	<2	Low	Moderate	Low	0.32	3	3
	10-18	<0.2	0.13-0.15	7.4-8.4	2-4	Moderate	High	Moderate	0.32		
	18-27	0.6-2.0	0.11-0.13	7.4-9.0	2-8	Moderate	High	Moderate	0.32		
	27-60	0.6-2.0	---	7.4-9.0	2-8	Low	High	Moderate	---		
VaC*, VaD*:											
Vebar	0-28	2.0-6.0	0.15-0.17	6.1-7.8	<2	Low	Moderate	Low	0.20	4	3
	28-60	---	---	---	---	---	---	---	---		
Cohagen	0-16	2.0-6.0	0.13-0.18	7.4-8.4	<2	Low	Moderate	Low	0.24	2	3
	16-60	---	---	---	---	---	---	---	---		
VbB*:											
Vebar	0-28	2.0-6.0	0.15-0.17	6.1-7.8	<2	Low	Moderate	Low	0.20	4	3
	28-60	---	---	---	---	---	---	---	---		
Tally	0-7	2.0-6.0	0.10-0.16	6.6-7.8	<2	Low	High	Low	0.20	5	3
	7-36	2.0-6.0	0.10-0.16	6.6-7.8	<2	Low	High	Low	0.20		
	36-60	6.0-20	0.06-0.10	7.4-8.4	<2	Low	High	Low	0.17		
WaD: Wabek	0-5	2.0-6.0	0.13-0.15	6.6-7.3	<2	Low	Moderate	Low	0.20	2	3
	5-12	2.0-6.0	0.11-0.15	6.6-7.8	<2	Low	Moderate	Low	0.10		
	12-60	>20	0.02-0.04	7.4-7.8	<2	Low	Moderate	Low	0.10		
WbA: Wabek	0-5	2.0-6.0	0.20-0.22	6.6-7.3	<2	Low	Moderate	Low	0.28	2	3
	5-60	>20	0.02-0.04	7.4-7.8	<2	Low	Moderate	Low	0.10		
WcA: Watrous	0-5	0.6-2.0	0.20-0.24	5.6-7.8	<2	Moderate	High	Low	0.28	2	6
	5-14	0.6-2.0	0.15-0.19	6.1-7.8	<2	Moderate	High	Low	0.28		
	14-60	---	---	---	---	---	---	---	---		
YaB: Yegen	0-5	0.6-2.0	0.18-0.20	6.1-7.3	<2	Low	Moderate	Low	0.28	4	6
	5-26	0.6-2.0	0.17-0.19	6.1-7.3	<2	Moderate	High	Low	0.32		
	26-51	0.6-6.0	0.10-0.17	6.6-7.8	<2	Low	High	Low	0.32		
	51-60	---	---	---	---	---	---	---	---		
YaC: Yegen	0-5	2.0-6.0	0.11-0.15	6.1-7.3	<2	Low	Moderate	Low	0.20	4	3
	5-26	0.6-2.0	0.17-0.19	6.1-7.3	<2	Moderate	High	Low	0.32		
	26-51	0.6-6.0	0.10-0.17	6.6-7.8	<2	Low	High	Low	0.32		
	51-60	---	---	---	---	---	---	---	---		
Za: Zeona	0-60	6.0-20	0.06-0.10	5.6-8.4	<2	Very low	Low	Low	0.17	5	2

* See map unit description for the composition and behavior of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "brief," "apparent," and "perched." The symbol < means less than; > means greater than. Absence of an entry indicates the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
AaB*:										
Absher	D	None	---	---	>6.0	---	---	>60	---	Low.
Loburn	D	None	---	---	>6.0	---	---	>60	---	Low.
AbC*:										
Absher	D	None	---	---	>6.0	---	---	>60	---	Low.
Slickspots.										
Ac*:										
Absher	D	None	---	---	>6.0	---	---	>60	---	Low.
Trembles	B	Occasional	Brief	Apr-Jun	>6.0	---	---	>60	---	Moderate.
Slickspots.										
AdD*:										
Amor	B	None	---	---	>6.0	---	---	20-40	Rippable	Moderate.
Cabba	D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate.
Ar Arnegard	B	Frequent	Very brief	Mar-Oct	3.0-6.0	Perched	Mar-Oct	>60	---	Moderate.
Ba*. Badland										
Bb Banks	A	None to common.	Brief	Mar-Jun	4.0-6.0	Apparent	Nov-Jun	>60	---	Low.
BcA*:										
Belfield	C	None	---	---	>6.0	---	---	>40	Rippable	Low.
Grail	C	Frequent	Very brief	Mar-Oct	3.0-6.0	Perched	Mar-Oct	>60	---	Moderate.
BdB*:										
Belfield	C	None	---	---	>6.0	---	---	>40	Rippable	Low.
Marmarth	B	None	---	---	>6.0	---	---	20-40	Rippable	Moderate.
BeC*:										
Belfield	C	None	---	---	>6.0	---	---	>40	Rippable	Low.
Morton	B	None	---	---	>6.0	---	---	20-40	Rippable	Moderate.
BfA*:										
Belfield	C	None	---	---	>6.0	---	---	>40	Rippable	Low.
Rhoades	D	None	---	---	>6.0	---	---	>40	Rippable	Low.
BhE*:										
Blackhall	D	None	---	---	>6.0	---	---	10-20	Rippable	Low.
Cabbart	D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate.
CaE*:										
Cabba	D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate.
Lantry	B	None	---	---	>6.0	---	---	20-40	Rippable	Low.
CbD*:										
Cabba	D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
CbD*:										
Trembles	B	Occasional	Brief	Apr-Jun	>6.0	---	---	>60	---	Moderate.
CcD*:										
Cabba	D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate.
Wayden	D	None	---	---	>6.0	---	---	10-20	Rippable	Low.
CdE*:										
Cohagen	D	None	---	---	>6.0	---	---	4-20	Rippable	Moderate.
Vebar	B	None	---	---	>6.0	---	---	20-40	Rippable	Low.
DaB*:										
Daglum	D	None	---	---	>6.0	---	---	>40	Rippable	Moderate.
Felor	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Db*:										
Dimmick	D	Common	Very long	Apr-Jun	1.0-3.0	Apparent	Oct-Jun	>60	---	Moderate.
Heil	D	Common	Very long	Apr-Jun	+.5-1.0	Perched	Oct-Jun	>60	---	Moderate.
FaA, FaB Farnuf	B	None	---	---	>6.0	---	---	>60	---	Moderate.
FbA*:										
Farnuf	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Daglum	D	None	---	---	>6.0	---	---	>40	Rippable	Moderate.
FcB*, FcC*:										
Felor	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Yegen	B	None	---	---	>6.0	---	---	40-60	Rippable	Moderate.
Fd. Fluvaquents										
Ga Grail	C	Frequent	Very brief	Mar-Oct	3.0-6.0	Perched	Mar-Oct	>60	---	Moderate.
LaA, LaB, LaC Lawther	D	None	---	---	>6.0	---	---	>60	---	Low.
LbB Lefor	B	None	---	---	>6.0	---	---	20-40	Rippable	Moderate.
MaB Manning	B	None	---	---	>6.0	---	---	>60	---	Low.
MbB Marmarth	B	None	---	---	>6.0	---	---	20-40	Rippable	Moderate.
McA, McB, McC Morton	B	None	---	---	>6.0	---	---	20-40	Rippable	Moderate.
MdC*, MdD*:										
Morton	B	None	---	---	>6.0	---	---	20-40	Rippable	Moderate.
Lantry	B	None	---	---	>6.0	---	---	20-40	Rippable	Low.
MeD*:										
Morton	B	None	---	---	>6.0	---	---	20-40	Rippable	Moderate.
Rhoades	D	None	---	---	>6.0	---	---	>40	Rippable	Low.
Pa Parshall	B	None	---	---	>6.0	---	---	>60	---	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
Pb. Psamments										
RaA, RaC----------- Reeder	B	None---------	---	---	>6.0	---	---	20-40	Rippable	Moderate.
RbB*:										
Reeder-----------	B	None---------	---	---	>6.0	---	---	20-40	Rippable	Moderate.
Amor--------------	B	None---------	---	---	>6.0	---	---	20-40	Rippable	Moderate.
RcC*:										
Reeder-----------	B	None---------	---	---	>6.0	---	---	20-40	Rippable	Moderate.
Lantry-----------	B	None---------	---	---	>6.0	---	---	20-40	Rippable	Low.
RdB*:										
Reeder-----------	B	None---------	---	---	>6.0	---	---	20-40	Rippable	Moderate.
Rhoades----------	D	None---------	---	---	>6.0	---	---	>40	Rippable	Low.
ReB*:										
Regent-----------	C	None---------	---	---	>6.0	---	---	20-40	Rippable	Low.
Daglum-----------	D	None---------	---	---	>6.0	---	---	>40	Rippable	Moderate.
RfB*:										
Regent-----------	C	None---------	---	---	>6.0	---	---	20-40	Rippable	Low.
Savage-----------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate.
RhD*:										
Regent-----------	C	None---------	---	---	>6.0	---	---	20-40	Rippable	Low.
Wayden-----------	D	None---------	---	---	>6.0	---	---	10-20	Rippable	Low.
RkD*:										
Rhoades----------	D	None---------	---	---	>6.0	---	---	>40	Rippable	Low.
Cabba------------	D	None---------	---	---	>6.0	---	---	10-20	Rippable	Moderate.
RmC*:										
Rhoades----------	D	None---------	---	---	>6.0	---	---	>40	Rippable	Low.
Daglum-----------	D	None---------	---	---	>6.0	---	---	>40	Rippable	Moderate.
Slickspots.										
RnD*:										
Rhoades----------	D	None---------	---	---	>6.0	---	---	>40	Rippable	Low.
Rock outcrop.										
RoE*:										
Rock outcrop.										
Cabba------------	D	None---------	---	---	>6.0	---	---	10-20	Rippable	Moderate.
SaA--------------- Savage	C	None---------	---	---	>6.0	---	---	>60	---	Moderate.
SbA*:										
Savage-----------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate.
Daglum-----------	D	None---------	---	---	>6.0	---	---	>40	Rippable	Moderate.
Sc---------------- Shambo	B	None---------	---	---	>6.0	---	---	>60	---	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
Sd----------------- Shambo	B	Common------	Brief-----	Apr-Oct	>6.0	---	---	>60	---	Moderate.
SeA---------------- Stady	B	None--------	---	---	>6.0	---	---	>60	---	Moderate.
Sh*:										
Lohler------------	C	Occasional	Brief-----	Apr-Jun	>6.0	---	---	>60	---	Moderate.
Trembles----------	B	Occasional	Brief-----	Apr-Jun	>6.0	---	---	>60	---	Moderate.
Ta, Tb------------ Trembles	B	Occasional	Brief-----	Apr-Jun	>6.0	---	---	>60	---	Moderate.
TcD*:										
Twilight----------	B	None--------	---	---	>6.0	---	---	20-40	Rippable	Low.
Marmarth----------	B	None--------	---	---	>6.0	---	---	20-40	Rippable	Moderate.
Parchin-----------	D	None--------	---	---	>6.0	---	---	20-40	Rippable	Low.
VaC*, VaD*:										
Vebar-------------	B	None--------	---	---	>6.0	---	---	20-40	Rippable	Low.
Cohagen-----------	D	None--------	---	---	>6.0	---	---	4-20	Rippable	Moderate.
VbB*:										
Vebar-------------	B	None--------	---	---	>6.0	---	---	20-40	Rippable	Low.
Tally-------------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate.
WaD, WbA---------- Wabek	A	None--------	---	---	>6.0	---	---	>60	---	Low.
WcA---------------- Watrous	B	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate.
YaB, YaC---------- Yegen	B	None--------	---	---	>6.0	---	---	40-60	Rippable	Moderate.
Za----------------- Zeona	A	None--------	---	---	>6.0	---	---	>60	---	Low.

* See map unit description for the composition and behavior of the map unit.

TABLE 17.--ENGINEERING TEST DATA

[Dashes indicate data were not available]

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution										Liquid limit	Plasticity index	Moisture density	
			Percentage passing sieve--							Percentage smaller than--						
	AASHTO	Unified	2 inch	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm			Maximum density	Optimum moisture
													Pct		Lb/ft3	Pct
Belfield silt loam (S68SD-105-004)																
B21t---- 10 to 16	A-6(11)	ML	100	100	100	100	100	100	81	--	36	--	38	13	104	20
Ccacs--- 28 to 48	A-6(12)	CL	100	100	100	100	100	98	81	--	38	--	37	16	110	17
Cabba loam (S68SD-105-005)																
Cca----- 03 to 14	A-6(13)	CL	100	100	100	100	99	98	84	--	36	--	38	15	106	19
Cohagen loamy very fine sand (S68SD-105-003)																
C------- 03 to 16	A-6(01)	SM	100	100	96	95	95	94	40	--	8	--	38	12	102	20
Morton loam (S68SD-105-007)																
B2t----- 07 to 14	A-6(09)	CL	100	100	100	99	99	97	80	--	30	--	34	12	107	18
Cca----- 18 to 26	A-6(14)	CL	100	100	100	100	100	100	95	--	38	--	36	14	107	18
Parshall fine sandy loam (S68SD-105-006)																
B2------ 09 to 18	A-4(00)	SM-SC	100	100	100	99	99	96	41	--	8	--	22	4	116	14
Savage silty clay loam (S68SD-105-001)																
B21t---- 05 to 14	A-7-6															
B21t---- 05 to 14	A-7-6															
Shambo loam (S74SD-105-110)																
B22ca--- 14 to 28	A-4(03)	SM	100	100	100	100	99	98	48	--	17	--	23	3	113	15
B3ca---- 28 to 43	A-4(08)	ML	100	100	100	100	100	99	80	--	25	--	30	8	108	17
C1------ 43 to 60	A-4(08)	ML	100	100	100	100	100	99	83	--	25	--	30	9	108	18
Stady loam (S68SD-105-008)																
B21----- 06 to 16	A-6(10)	CL	100	100	100	100	99	97	71	--	36	--	38	15	103	20
IIc2---- 32 to 60	A-1-A(00)	SW-SM	100	90	74	60	43	28	11	--	3	--	24	5	132	9
Vebar fine sandy loam (S68SD-105-002)																
B21----- 04 to 15	A-2-4(00)	SC	100	100	100	100	100	100	28	--	14	--	27	8	108	18

TABLE 18.--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
Absher	Fine, montmorillonitic Borollic Natrargids
Amor	Fine-loamy, mixed Typic Haploborolls
Arnegard	Fine-loamy, mixed Pachic Haploborolls
Banks	Sandy, mixed, frigid Typic Ustifluvents
Belfield	Fine, montmorillonitic Glossic Natriborolls
Blackhall	Loamy, mixed (calcareous), frigid, shallow Ustic Torriorthents
Cabba	Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents
Cabbart	Loamy, mixed (calcareous), frigid, shallow Ustic Torriorthents
Cohagen	Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents
Daglum	Fine, montmorillonitic Typic Natriborolls
Dimmick	Fine, montmorillonitic, frigid Vertic Haplaquolls
Farnuf	Fine-loamy, mixed Typic Argiborolls
Felor	Fine-loamy, mixed Typic Argiborolls
Grail	Fine, montmorillonitic Pachic Argiborolls
Heil	Fine, montmorillonitic, frigid Typic Natraquolls
Lantry	Fine-silty, mixed (calcareous), frigid Typic Ustorthents
Lawther	Fine, montmorillonitic Vertic Haploborolls
Lefor	Fine-loamy, mixed Typic Argiborolls
Loburn	Fine, montmorillonitic Borollic Natrargids
Lohler	Fine, montmorillonitic (calcareous), frigid Typic Ustifluvents
Manning	Coarse-loamy over sandy or sandy-skeletal, mixed Typic Haploborolls
Marmarth	Fine-loamy, mixed Aridic Argiborolls
Morton	Fine-silty, mixed Typic Argiborolls
Parchin	Fine-loamy, mixed Borollic Natrargids
Parshall	Coarse-loamy, mixed Pachic Haploborolls
Reeder	Fine-loamy, mixed Typic Argiborolls
Regent	Fine, montmorillonitic Typic Argiborolls
Rhoades	Fine, montmorillonitic Leptic Natriborolls
Savage	Fine, montmorillonitic Typic Argiborolls
Shambo	Fine-loamy, mixed Typic Haploborolls
Stady	Fine-loamy over sandy or sandy-skeletal, mixed Typic Haploborolls
Tally	Coarse-loamy, mixed Typic Haploborolls
Trembles	Coarse-loamy, mixed (calcareous), frigid Typic Ustifluvents
Twilight	Coarse-loamy, mixed Borollic Camborthids
Vebar	Coarse-loamy, mixed Typic Haploborolls
Wabek	Sandy-skeletal, mixed Entic Haploborolls
*Watrous	Fine-loamy, mixed Typic Argiborolls
Wayden	Clayey, montmorillonitic (calcareous), frigid, shallow Typic Ustorthents
Yegen	Fine-loamy, mixed Typic Argiborolls
Zeona	Mixed, frigid Ustic Torripsamments

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