SOIL SURVEY OF

Beadle County, South Dakota

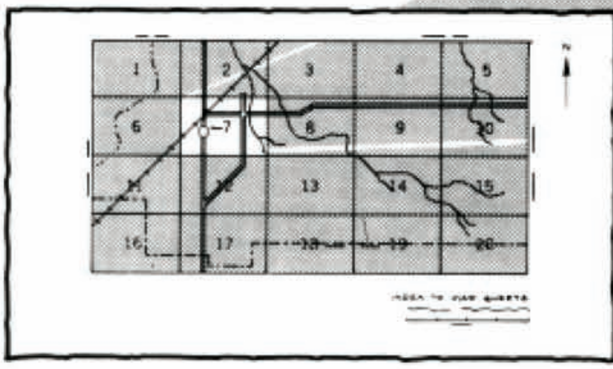
United States Department of Agriculture
Soil Conservation Service

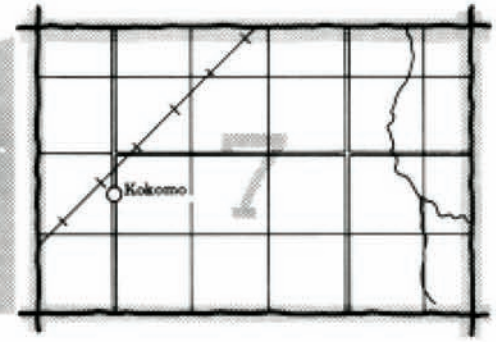
in cooperation with

South Dakota Agricultural Experiment Station

HOW TO USE

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





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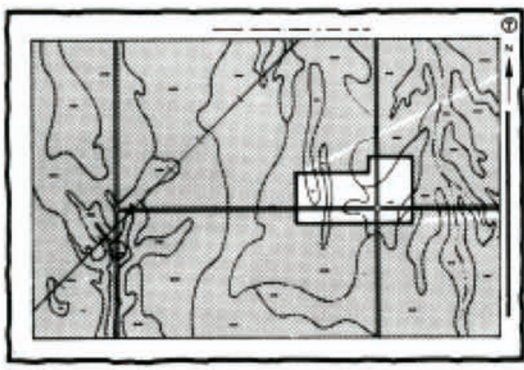
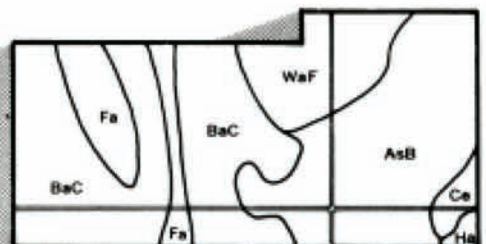
3. Locate your area of interest on the map sheet.





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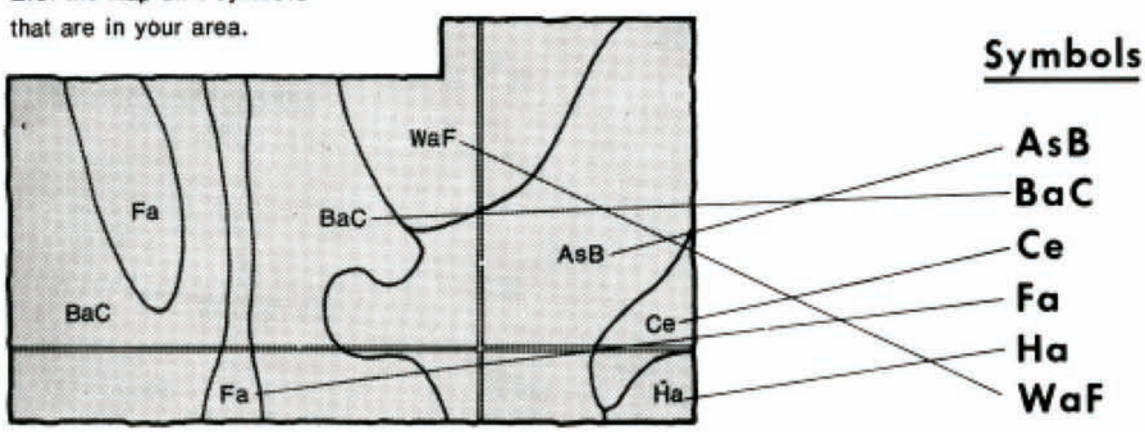
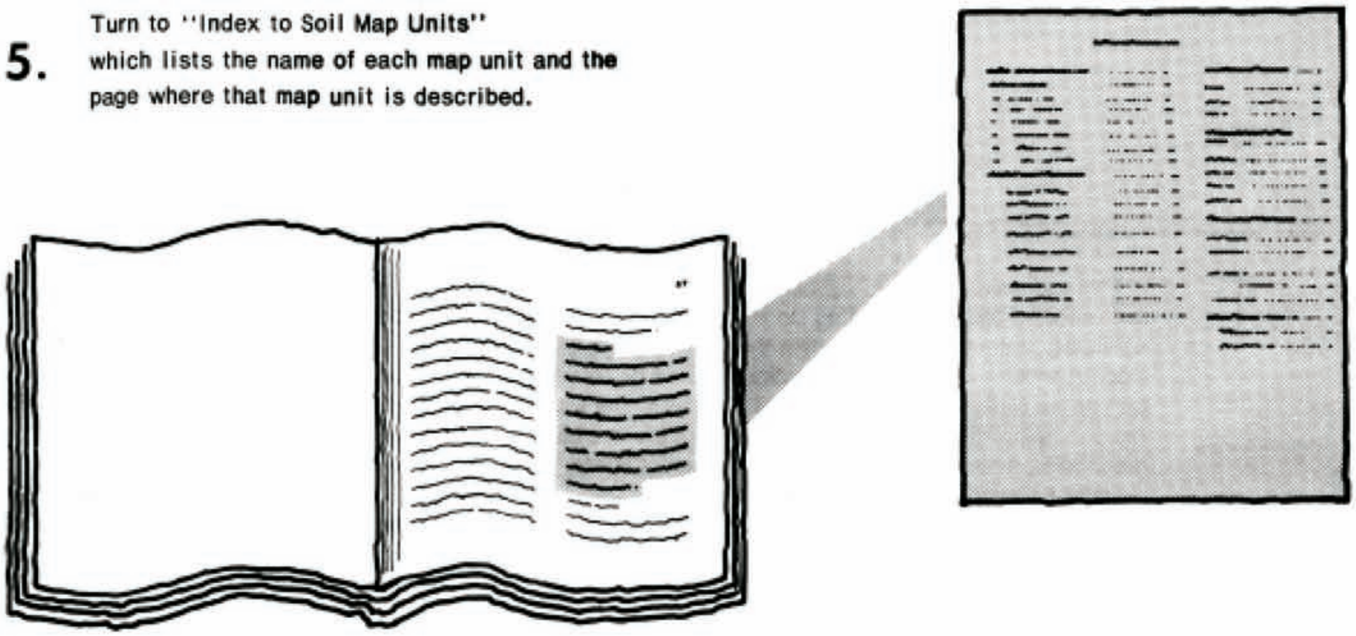
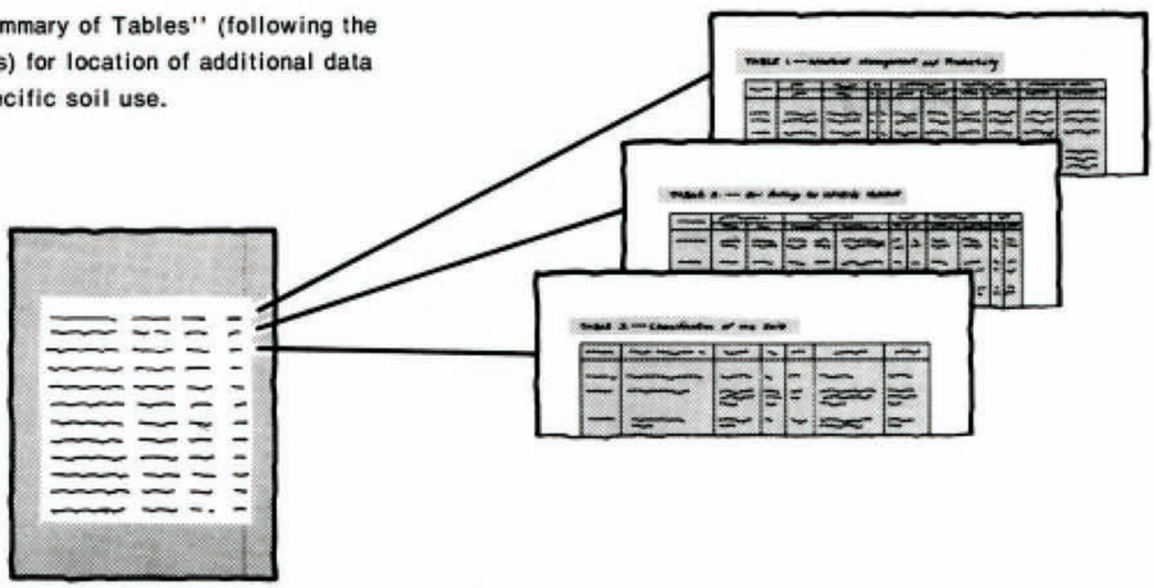


THIS SOIL SURVEY

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 1961-75. Soil names and descriptions were approved in 1976. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1975. This survey was made cooperatively by the Soil Conservation Service and the South Dakota Agricultural Experiment Station. It is part of the technical assistance furnished to the Beadle County Conservation District.

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: Typical area of the Betts-Lamo map unit. Lamo soils are on the bottom land along the James River. Betts and Ethan soils are on valley sides.

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Foreword

The Soil Survey of Beadle 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.

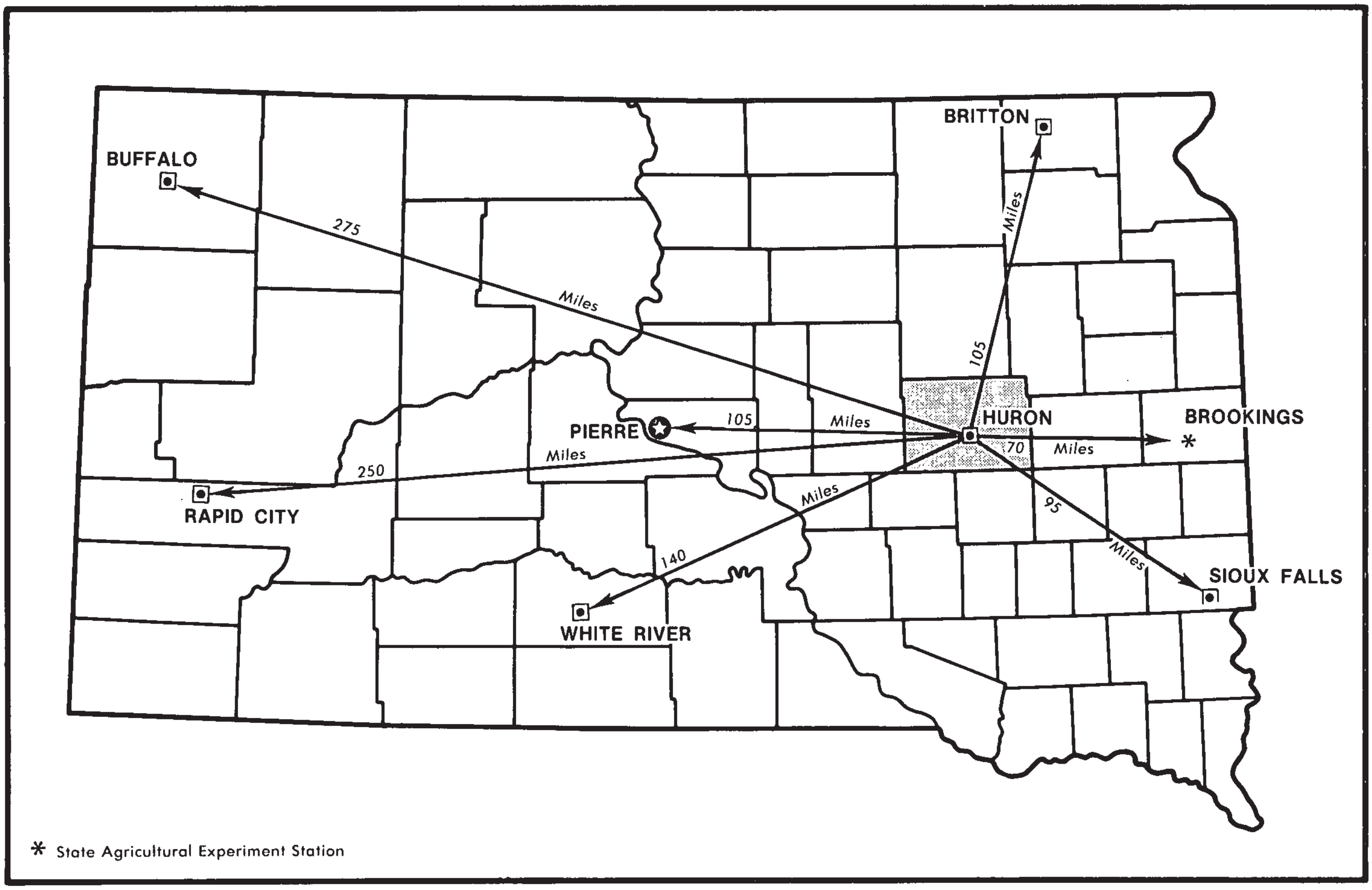
This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers 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 Beadle County in South Dakota.

SOIL SURVEY OF BEADLE COUNTY, SOUTH DAKOTA

By Dennis M. Heil, Soil Conservation Service

Soils surveyed by Dennis M. Heil, Glenn A. Borchers, Glenn R. Dunavan, and Vernon W. Moxon, Soil Conservation Service

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

BEADLE COUNTY is in the east-central part of South Dakota (see facing page). It has a total area of 809,600 acres, of which 3,136 acres is bodies of water that are more than 40 acres in size. Huron, the largest town, is the county seat.

Most of the county lies within the James River Lowland, a subdivision of the Central Lowlands physiographic province (*3*). The southwest corner of the county is in the Coteau du Missouri, a division of the Missouri Plateau part of the Great Plains province, and is known locally as the Wessington Hills. The southern tip of the Lake Dakota plain extends a few miles into the north-central part of the county.

The James River Lowland is a nearly level to undulating glacial till plain at an elevation ranging from 1,300 to 1,400 feet. Into this surface, the south-flowing James River has cut a steep-walled, narrow valley 30 to 100 feet deep. This river meanders across the flood plain, dropping in elevation an average of only about 1 inch per mile in the county. Except for the Wessington Hills and the rolling to steep sides of the James River trench, the relief is nearly level to gently rolling.

General nature of the county

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

Settlement

The boundaries of Beadle County were surveyed in 1872 by General William H. H. Beadle. In 1873, the county was established by an act of the Dakota Territory Legislature and named after General Beadle.

The first settlers came to the county during the 1870's. They settled mainly along the James River. The largest influx of people into the county occurred in the early 1880's soon after the Chicago-Northwestern Railway laid out the original townsite of Huron and set aside a tract of land for railroad terminal facilities. Within a few years, three railroads crossed the county and Huron had become a railroad center. Settlers and immigrants arrived by train almost daily.

The county was formally organized in 1880. The population was 1,290 in 1880, grew to 10,138 in 1885, and gradually increased to its peak in the decade between 1920 and 1930. From the drought and depression of the 30's to the present, the rural population, including that of the smaller towns, has decreased significantly. This decrease has been partly offset by a slight growth in the city of Huron. In 1970, the population of the county was 20,877. The rural population includes communal settlements referred to as "colonies." These are the Huron Colony and Riverside Colony along the James River and the Pearl Creek Colony along Middle Pearl Creek.

Huron, the fourth largest city in South Dakota, had a population of 14,299 in 1970. It is the site of the South Dakota State Fair and of Huron College, a private liberal arts college. It has a meat packing plant and dairy processing and produce plants and is an important farm supply and trade center. Other towns and villages in the county, all having a population of less than 500, are Bonilla, Broadland, Cavour, Hitchcock, Virgil, Wessington, Wolsey, and Yale.

Natural resources

Soil is the most important resource in the county. Crops produced on farms and livestock that graze the grasslands and are fed crops produced on the farms are marketable products that are affected by the soil.

Shallow wells and surface water impoundments are the source of water for domestic and livestock use in most of the county. The shallow wells range from less than 10 to 50 feet or more in depth. The quantity and quality of the water ranges from poor to good. The most reliable shallow aquifer is the Central James aquifer complex, which occurs in an irregular pattern on both sides of the James River (*5*). Both the quantity and quality generally are more satisfactory than in other parts of the county. In places the volume and quality are adequate for irrigation.

The sandstone beds of the Dakota Group are the most widely developed aquifers in the bedrock underlying the glacial deposits. The wells range from 700 to 1,100 feet in depth, and many have an artesian flow. Niobrara Marl and the Codell Sandstone Member of the Carlile Formation also are important bedrock aquifers underlying the eastern two-thirds of the county. Well depths range from 140 to 250 feet. The quality of water in both bedrock aquifers generally is poor, and the water is not suitable for irrigation.

Mineral resources in the county consist mainly of deposits of outwash sand and gravel, which are used in construction.

Climate

Beadle 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 precipitation falls during the warm period. Precipitation 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 Huron, South Dakota for the period 1951 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 16 degrees F, and the average daily minimum temperature is 6 degrees. The lowest temperature on record, which occurred at Huron on February 28, 1962, is minus 39 degrees. In summer the average temperature is 71 degrees, and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred on July 10, 1966, is 112 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, 14 inches, or 74 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 5.31 inches at Huron on June 18, 1967. Thunderstorms occur on about 41 days each year, and 27 of these days are in summer.

Average seasonal snowfall is 41 inches. The greatest snow depth at any one time during the period of record was 28 inches. On the average, 39 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 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The percentage of possible sunshine is 75 in summer and 55 in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 14 miles per hour, in April.

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

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

Farming

Wheat was the principal crop of the first settlers, but farming was more diversified after the settlers were established. Corn and oats became important because feed crops were needed by the growing numbers of cattle, hogs, and chickens. Most of the small farms had a few dairy or dual-purpose cattle, some hogs, and a flock of chickens.

Beadle County farmers increased the acreage of cropland during World War I because of the increased demand for wheat to help meet the need for food. Despite unfavorable market prices, cropland was intensively farmed and native and tame pastures were overgrazed in the decade that followed. During this period, little attention was given to conservation farming. Fall plowing was common, and grain stubble was commonly burned. As a result, when the drought of the 30's came, the soils were unprotected and highly susceptible to soil blowing. Soil blowing became a problem throughout much of the county.

In 1935, interested farmers enlisted the Soil Erosion Service (later to become the Soil Conservation Service) and the Civilian Conservation Corps to help reclaim their land. The Civilian Conservation Corps supplied the labor, and the Soil Erosion Service provided technical assistance in putting measures that control soil blowing into effect. Dunes of blown soil were leveled, and small dams were built to provide water for livestock.

The enactment of Soil Conservation District legislation by the 1937 South Dakota Legislature stirred the interest of landowners in three townships in the northeastern part of the county. These townships joined seven townships in neighboring Clark and Spink Counties to form the Carpenter Soil Conservation District in 1940. In 1942, 13 townships in the western part of the county formed the West Beadle District. The remaining townships in the county were added to the West Beadle District in 1946. In 1961, the Carpenter District was dissolved and the three Beadle County townships joined the West Beadle District. The district, renamed the Beadle County Conservation District, includes the entire county. Conservation plans have been developed on a total of 305,000 acres in the Beadle County Conservation District.

Slightly more than 70 percent of the county is used for crops and for tame pasture and hayland. Corn, spring wheat, oats, and alfalfa are the main crops. According to the South Dakota Crop and Livestock Reporting Service, 133,000 acres was planted to corn, 73,000 acres to spring wheat, and 68,000 acres to oats in 1975 (*6*). Alfalfa hay was harvested on 75,000 acres. Smaller acreages were planted to barley, sorghum, rye, and winter wheat. About 30 percent of the county is in native grass and is used for grazing.

Since 1945, the number of cattle in Beadle County has gradually increased. In 1975, the number of cattle of all classes was 143,000. About 58,000 were beef cows held for breeding, and 4,000 were held for milk production. There were about 28,000 hogs and 18,000 sheep. Further information about trends in crops and livestock can be obtained from the annual reports of the South Dakota Crop and Livestock Reporting Service.

The capability and potentials of the soils in Beadle County indicate that wheat production and the production of beef cattle and hogs for meat and dairying will continue to be the basis of the economy in the county.

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 in this county have been grouped for broad interpretative purposes. The 3 broad groups and the 11 map units are described on the following pages.

Somewhat poorly drained to excessively drained soils formed mainly in glacial till and glacial drift

This group consists mainly of deep, well drained and moderately well drained loamy soils that formed in glacial till and glacial drift. Moderately well drained to poorly drained soils are in swales and depressions throughout the uplands and on narrow strips of bottom land. The soils are mostly nearly level to undulating but are hilly to steep on breaks along the James River and its tributaries and on outliers of the Wessington Hills in the southwestern part of the county.

This group makes up about 85 percent of the county. Most of the soils are used for crops and tame pasture or hayland. Most of the gently rolling to steep soils and some of the wetter soils remain in native vegetation and are used for range and wildlife habitat. Except for the periodic shortages of moisture common to the climate, the nearly level, well drained soils have few limitations for crops. Improving water intake is a management concern on the soils that have a claypan subsoil. Controlling erosion is the main concern on the undulating to steep soils. Wetness is a limitation on the more poorly drained soils.

1. Beadle

Deep, well drained, nearly level to gently rolling loamy soils formed in glacial till on uplands

This map unit is on a glacial till plain consisting of upland flats and gentle swells that rise 5 to 20 feet above nearly level areas. Slopes are mostly nearly level to undulating but are gently rolling along drainageways and in stream valleys. The drainage pattern throughout much of the unit is well defined.

This map unit makes up about 14 percent of the county. It is about 65 percent Beadle soils and 35 percent minor soils.

Beadle soils have a surface layer of dark gray loam and a subsoil of firm clay loam and clay. The underlying material is calcareous clay loam. Available water capacity is high, but permeability is moderately slow and the clayey subsoil releases moisture slowly to plants. These soils shrink and swell markedly upon drying and wetting.

Minor in this map unit are the moderately well drained Bon soils and poorly drained Durrstein soils on bottom land along streams and drainageways; the Delmont and Enet soils in areas that are underlain by sand and gravel; the moderately well drained Dudley, Jerauld, and Stickney soils in swales and along drainageways; and the poorly drained Hoven and Tetonka soils in closed depressions. The Dudley, Durrstein, Jerauld, and Stickney soils have a claypan subsoil and contain more sodium than Beadle soils.

About 65 percent of the acreage of this map unit is used for cultivated crops and tame pasture or hayland. Small grain, alfalfa, and tame grasses generally are better suited than corn. The steeper and more rolling parts of the unit, some areas of the claypan soils, and many of the closed depressions or potholes remain in native grass and are used for range. Runoff is slow to medium, and water collects in the swales and depressions. Improving water intake, conserving moisture, maintaining tilth, and controlling erosion and soil blowing are the main concerns if this unit is used for crops and many other purposes.

Beadle soils have good potential for cultivated crops, tame pasture and hayland, range, and rangeland wildlife habitat; fair to good potential for openland wildlife habitat and most recreation uses; and fair potential for windbreaks and environmental plantings. Measures that overcome the limitations of these soils generally are easy to apply. Most of the minor soils have poor to fair potential for those uses. Almost all of the soils have poor potential for most urban uses.

2. Beadle-Dudley

Deep, well drained, nearly level to undulating loamy soils and deep, moderately well drained, nearly level soils that have a claypan subsoil; all formed in glacial till on uplands

This map unit is on a glacial till plain consisting of broad upland flats that have low local relief. Many shallow swales and slight depressions are evident. Slopes are mostly nearly level but are undulating along streams and drainageways and around some of the closed depressions. The larger drainageways are well defined, but the drainage pattern is poorly defined in some areas where small drainageways terminate in closed depressions.

This map unit makes up about 4 percent of the county. It is about 45 percent Beadle soils, 35 percent Dudley soils, and 20 percent minor soils.

The well drained Beadle soils are on plane to slightly convex rises. They have a surface layer of dark gray loam and a subsoil of firm clay loam and clay. The underlying material is calcareous clay loam. Dudley soils are in swales and slightly depressed areas where the surface is slightly concave. They have a surface layer of dark gray silt loam, a thin subsurface layer of gray silt loam, and a claypan subsoil of very firm clay and clay loam. The underlying material is calcareous clay loam and silty clay loam.

In both soils, available water capacity is high or moderate and permeability is moderately slow to very slow. These soils release moisture slowly to plants, and the claypan subsoil of the Dudley soils especially limits water intake and the growth of plant roots. Both soils shrink and swell markedly upon drying and wetting.

Minor in this map unit are the moderately well drained Bon soils and poorly drained Durrstein soils on bottom land along streams and drainageways; the Delmont and Enet soils in areas that are underlain by sand and gravel; the moderately well drained Jerauld and Stickney soils in low areas intermingled with Dudley soils; and the poorly drained Hoven and Tetonka soils in closed depressions. The Durrstein, Jerauld, and Stickney soils have a claypan subsoil and, like Dudley soils, contain more sodium than Beadle soils.

About half of the acreage of this map unit is used for cultivated crops and tame pasture or hayland. Small grain, alfalfa, and tame grasses generally are better suited than corn. Many areas of the Dudley soils and other claypan soils and most of the closed depressions remain in native grass and are used for range. Runoff throughout much of the area is slow, and water collects on the Dudley soils and in the depressions. The soils in this unit dry slowly, and spring planting is delayed during wet years. Improving water intake, maintaining tilth, and controlling soil blowing are the main concerns if the soils are used for crops and many other purposes.

This map unit has fair potential for crops and fair to good potential for tame pasture, hayland, and range. The potential for openland and rangeland wildlife habitat is good on the Beadle soils and poor on the Dudley soils. The potential for windbreaks and environmental plantings is fair on the Beadle soils and poor on the Dudley soils and many of the minor soils. The potential for most recreation uses is fair to good on the Beadle soils and fair to poor on the Dudley soils and many of the minor soils. The Beadle and Dudley soils and most of the minor soils have poor potential for most urban uses.

3. Betts-Ethan

Deep, excessively drained and well drained, gently rolling to steep loamy soils formed in glacial till on uplands

This map unit is on upland ridges and along entrenched drainageways. Slopes are short and convex and are mostly gently rolling to steep. Less steep slopes are on some of the broader ridgetops and on foot slopes, fans, and bottom land. Scattered glacial stones and boulders are on the surface in some areas. The drainage pattern is well defined.

This map unit makes up less than 1 percent of the county. It is about 45 percent Betts soils, 35 percent Ethan soils, and 20 percent minor soils.

The excessively drained Betts soils generally are on the higher and steeper parts of the landscape. The well drained Ethan soils generally are below the Betts soils. Both soils have a loam surface layer, a loam or light clay loam subsoil, and clay loam underlying material. Betts soils are calcareous at or near the surface, and Ethan soils are calcareous within a depth of 10 inches.

In both soils, available water capacity is high, but much of the precipitation is lost because runoff is medium to rapid. Permeability is moderate in the upper part of both soils and moderately slow in the underlying material. Fertility is low to medium. The shrink-swell potential is moderate.

Minor in this map unit are the Davis soils on foot slopes, fans, and bottom land along drainageways; the Hand and Houdek soils on some of the broader ridgetops and on foot slopes below Ethan soils; and the Zell soils on some of the ridgetops. Davis, Hand, and Houdek soils are dark colored and are leached of lime to a greater depth than Betts and Ethan soils. Zell soils are more silty than Betts soils.

Most of the acreage of this map unit remains in native grass and is used for range. Small areas of the less sloping minor soils are in cultivated crops. Controlling erosion and conserving moisture are the main concerns if this unit is used for range, tame pasture, or crops.

This map unit has fair to good potential for range and rangeland wildlife habitat; fair to poor potential for tame pasture and hayland; and poor potential for crops, windbreaks and environmental plantings, and most recreation uses. It has poor potential for most urban uses.

4. Betts-Lamo

Deep, excessively drained, gently rolling to steep loamy soils formed in glacial till on uplands and deep, somewhat poorly drained, nearly level silty soils formed in alluvium on bottom land

This map unit is on the valley sides and bottom land along the James River. Slopes on the valley sides are mostly hilly to steep, are short and convex, and are dissected by drainageways. Glacial stones and boulders are on the surface in some areas. The plane slopes on the bottom land are broken by the river channel and meander scars. The bottom land is flooded for short periods in some years.

This map unit makes up less than 2 percent of the county. It is about 40 percent Betts soils, 35 percent Lamo soils, and 25 percent minor soils.

The excessively drained Betts soils are on the valley sides. They have a thin surface layer and subsoil of calcareous, friable loam and are underlain by calcareous clay loam. The somewhat poorly drained Lamo soils are on the bottom land. The surface soil is a thick layer of dark grayish brown, friable silt loam, and the underlying material is calcareous silt loam and silty clay loam.

Fertility is low in the Betts soils and high in the Lamo soils. Permeability is moderately slow in the Lamo soils and in the underlying material of the Betts soils. Both soils shrink and swell upon drying and wetting.

Minor in this map unit are the poorly drained Egas soils in some of the low areas on bottom land; the well drained Ethan and Houdek soils on valley sides, generally below Betts soils; and the moderately well drained LaDelle soils on the higher lying parts of the bottom land.

About 60 percent of the acreage of this map unit remains in native grass and is used for range. About 40 percent, mainly the Lamo soils, is used for crops and tame pasture or hayland. Corn and alfalfa are the main crops on the Lamo soils, but some small grain also is grown. Spring planting on the Lamo soils is delayed in some years because of wetness from flooding and the seasonal high water table. Runoff is rapid on the Betts soils and slow on the Lamo soils. Controlling erosion and conserving moisture are the main management concerns on the Betts soils. Providing adequate drainage and maintaining tilth and fertility are the main concerns if the Lamo soils are used for crops and most other purposes.

This map unit has fair to good potential for range and fair potential for rangeland wildlife habitat. The Lamo soils have good potential for crops, tame pasture and hayland, windbreaks and environmental plantings, and openland wildlife habitat. The Betts soils have fair to poor potential for tame pasture and poor potential for crops and for windbreaks and environmental plantings. This unit has fair to poor potential for most recreation uses and poor potential for most urban uses.

5. Hand-Bonilla

Deep, well drained and moderately well drained, nearly level to gently rolling loamy soils formed in glacial drift on uplands

This map unit is on a glacial plain underlain by stratified loamy glacial drift. The plain consists of gentle swells that rise 10 to 30 feet above the intervening swales and numerous small depressions or potholes that dot the landscape. Slopes are mostly undulating, but some are nearly level and some are gently rolling. The steeper slopes are on sides of some of the ridges and along creeks and drainageways. The drainage pattern is well defined throughout much of the unit but is poorly defined in some of the nearly level areas where shallow swales terminate in closed depressions.

This map unit makes up about 19 percent of the county. It is about 30 percent Hand soils, 20 percent Bonilla soils, and 50 percent minor soils (fig. 1).

The well drained Hand soils are on rises or swells. The moderately well drained Bonilla soils are on foot slopes and in swales. Both soils have a surface layer and subsoil of friable loam and clay loam and are underlain by calcareous clay loam. Available water capacity is high. Permeability is moderate in the subsoil and moderate or moderately slow in the underlying material. The shrink-swell potential is moderate.

Minor in this map unit are the Betts and Ethan soils on the sides and tops of ridges and knolls or along drainageways; the Delmont and Enet soils in areas that are underlain by sand and gravel; the Dudley and Stickney soils in some of the swales and on flats; the poorly drained Durrstein and Egas soils on bottom land along drainageways; and the poorly drained Hoven and Tetonka soils in closed depressions. The Dudley and Stickney soils have a claypan subsoil and contain more sodium than Bonilla soils.

About 70 percent of the acreage of this map unit is used for crops and tame pasture or hayland. Corn, small grain, and alfalfa are the main crops. Some areas of the steeper soils on the sides of ridges and drainageways, some areas of the claypan soils, and many areas of the poorly drained soils on bottom land and in closed depressions remain in native grass and are used for range. Runoff is slow to medium, and water collects in the swales and depressions. Controlling erosion and conserving moisture are the main concerns if the major soils are cropped.

This map unit has good potential for crops, tame pasture and hayland, range, windbreaks and environmental plantings, and openland and rangeland wildlife habitat. It has fair to poor potential for most recreation and urban uses.

6. Houdek-Prosper-Dudley

Deep, well drained and moderately well drained, nearly level to undulating loamy soils and deep, moderately well drained, nearly level to undulating soils that have a claypan subsoil; all formed in glacial till on uplands

This map unit is on a glacial till plain consisting of gentle rises that rise 5 to 20 feet above broad flats, swales, and closed depressions. Slopes are mostly nearly level to undulating but are steeper along entrenched draingeways. The drainage pattern is well defined along the larger drainageways but is poorly defined in some areas where small drainageways terminate in the many sloughs and potholes that dot the landscape.

The map unit makes up about 3 percent of the county. It is about 40 percent Houdek soils, 20 percent Prosper soils, 20 percent Dudley soils, and 20 percent minor soils.

The well drained Houdek soils are on gentle rises. The moderately well drained Prosper soils are in concave swales. They have a thicker surface layer than Houdek soils, but otherwise the two soils are similar. Both soils have a surface layer of loam and a subsoil of friable to firm clay loam and are underlain by calcareous clay loam. The moderately well drained Dudley soils are on foot slopes in some of the swales and on flats along drainageways. They have a surface layer and subsurface layer of silt loam and a claypan subsoil of very firm clay and clay loam. The underlying material is calcareous clay loam and silty clay loam.

Fertility is medium to high in the Houdek and Prosper soils. Available water capacity is high. Permeability is moderate in the subsoil and moderately slow in the underlying clay loam. The shrink-swell potential is moderate. Fertility is medium in the Dudley soils. Available water capacity is moderate or high. The claypan subsoil of the Dudley soils limits water intake, the growth of plant roots, and the amount of moisture released to plants. The shrink-swell potential is high.

Minor in this map unit are the calcareous Betts and Ethan soils on some of the ridges and along entrenched drainageways; the moderately well drained Bon soils and poorly drained Durrstein and Egas soils on bottom land; the Delmont and Enet soils in areas that are underlain by sand and gravel; the poorly drained Hoven and Tetonka soils in closed depressions; and the moderately well drained Stickney soils intermingled with Dudley soils.

About 70 percent of the acreage of this map unit is used for crops and tame pasture or hayland. Corn, small grain, and alfalfa are the main crops. Some of the steeper areas bordering the larger creeks and drainageways, some areas of the Dudley soils and similar claypan soils, and many areas of the poorly drained minor soils on bottom land and in closed depressions remain in native grass and are used for range. Conserving moisture, maintaining tilth and fertility, improving water intake in the Dudley soils, and controlling erosion in sloping areas are the main concerns if this unit is cropped.

This map unit has good to fair potential for crops, tame pasture and hayland, and range. Small grain, alfalfa, and tame grasses are better suited than corn on the Dudley soils and similar claypan soils. Houdek and Prosper soils have good potential for windbreaks and environmental plantings and for openland wildlife habitat and good to fair potential for most recreation uses, but the Dudley soils have poor potential for those uses. This unit has fair to poor potential for most urban uses.

7. Houdek-Prosper

Deep, well drained and moderately well drained, nearly level to gently rolling loamy soils formed in glacial till on uplands

This map unit is on a glacial till plain consisting of broad flats, gentle swells, many concave swales, and many closed depressions. Slopes are mostly nearly level to undulating but are gently rolling or steeper in areas bordering the larger drainageways. Local relief commonly ranges from 10 to 30 feet, but it is less in a broad, nearly level area that is north of the village of Broadland and extends several miles to the southeast. The drainage pattern is well defined throughout much of the unit.

This map unit makes up about 42 percent of the county. It is about 35 percent Houdek soils, 20 percent Prosper soils, and 45 percent minor soils (fig. 2).

The well drained Houdek soils are in plane to convex areas. The moderately well drained Prosper soils are in concave swales and in some of the plane areas on the broad flats. Prosper soils have a thicker surface layer than Houdek soils, but otherwise the two soils are similar. Both soils have a loam surface layer and a friable to firm clay loam subsoil and are underlain by calcareous clay loam.

Fertility is medium to high. Available water capacity is high. Permeability is moderate in the subsoil and moderately slow in the underlying material. The shrink-swell potential is moderate.

Minor in this map unit are the Betts and Ethan soils on ridgetops and on the shoulders of drainageways; the Davison soils on foot slopes on the edges of some of the swales and depressions; the Delmont and Enet soils in areas that are underlain by sand and gravel; the Dudley and Stickney soils in swales and on flats along drainageways; the poorly drained Durrstein and Egas soils on bottom land along creeks; and the poorly drained Hoven and Tetonka soils in closed depressions. Dudley and Stickney soils have a claypan subsoil and contain more sodium than Houdek and Prosper soils.

About 80 percent of the acreage of this map unit is used for crops and tame pasture or hayland. Corn, small grain, and alfalfa are the main crops. Some areas of the steeper soils along entrenched drainageways, some areas of the minor soils that have a claypan subsoil, and many areas of the poorly drained soils in closed depressions or on bottom land remain in native grass and are used for range. Conserving moisture and maintaining tilth and fertility are management concerns if the soils in this unit are cropped. Controlling erosion is a major concern on soils that have slopes greater than 2 percent. Improving water intake is a management concern on some of the minor soils.

This map unit has good potential for crops, tame pasture and hayland, range, windbreaks and environmental plantings, and openland wildlife habitat. It has fair to good potential for most recreation uses and fair to poor potential for most urban uses. Some of the poorly drained minor soils have fair potential for wetland wildlife habitat.

Moderately well drained and well drained soils formed in glacial outwash and glacial drift

These soils are on uplands that are mantled by deposits of glacial outwash and stratified loamy glacial drift. The outwash material ranges from fine sandy loam to gravelly sand and is underlain by glacial till or glacial drift within a depth of 60 inches, commonly within 40 inches. Some of the soils have a perched water table during part of the growing season. The soils are mostly undulating, but some are nearly level and some are gently rolling. The steeper soils are on the shoulders of entrenched drainageways. Somewhat poorly drained to poorly drained soils are in some of the low areas and closed depressions.

These soils make up about 13 percent of the county. About 70 percent of the acreage is used for crops and tame pasture and hayland. Some of the steeper soils, some of the more sandy soils, and some of the wetter soils remain in native grass and are used for range or hayland. Controlling soil blowing and conserving moisture are the major concerns. Controlling erosion is a concern on some of the sloping soils. Wetness is a limitation on the more poorly drained soils.

8. Carthage-Hand

Deep, moderately well drained and well drained, nearly level to gently rolling loamy soils formed in glacial outwash and glacial drift on uplands

This map unit is on a glacial till plain that is mantled with glacial outwash sediments or stratified glacial drift. Typically, the plain consists of convex rises and many concave swales and low areas (fig. 3). Scattered closed depressions are throughout the unit. Slopes are mostly nearly level and undulating, but some are gently rolling. The steeper soils are on the shoulders of entrenched drainageways. The drainage pattern is poorly defined in parts of the unit but is well defined in areas near the larger drainageways.

This map unit makes up about 10 percent of the county. It is about 35 percent Carthage soils, 15 percent Hand soils, and 50 percent minor soils.

The moderately well drained Carthage soils are in convex to slightly concave areas. The surface layer is very dark gray fine sandy loam, and the subsurface layer and subsoil are very friable fine sandy loam. The underlying material to a depth of about 32 inches is loamy fine sand. Below this is calcareous clay loam. Available water capacity is moderate or high. A perched water table is within a depth of 4 feet early in the growing season. Permeability is moderately rapid in the upper part of the soils and moderately slow in the underlying clay loam. The shrink-swell potential is moderate in the underlying clay loam.

The well drained Hand soils are mainly on convex rises that lack a mantle of moderately sandy outwash sediments. They have a surface layer and subsoil of friable loam and clay loam. The underlying material is calcareous clay loam. Available water capacity is high, and permeability is moderate. The shrink-swell potential is moderate.

Minor in this map unit are the Betts and Ethan soils on ridgetops above Hand soils and on the shoulders of entrenched drainageways; the well drained Blendon soils intermingled with Carthage soils; the moderately well drained Bonilla soils intermingled with Hand soils in swales; the sandy Doger and Forestburg soils intermingled with Carthage soils in swales; the somewhat poorly drained Elsmere and Shue soils and poorly drained Loup soils in swales and low areas; and the poorly drained Hoven and Tetonka soils in closed depressions. Betts and Ethan soils are calcareous within a depth of 10 inches. Blendon, Doger, Elsmere, and Loup soils lack clay loam within a depth of 40 inches.

About 70 percent of the acreage of this map unit is used for crops and tame pasture and hayland. Corn, small grain, and alfalfa are the main crops. Some of the steeper soils and some of the poorly drained soils remain in native grass and are used for range or hay. Runoff is slow throughout much of the unit. Controlling soil blowing, conserving moisture, and maintaining tilth and fertility are the main concerns if the soils are cropped.

The major soils in this map unit have good potential for crops, tame pasture and hayland, range, windbreaks and environmental plantings, rangeland wildlife habitat, and most recreation uses. They have fair to good potential for openland wildlife habitat and fair to poor potential for most urban uses. Deep-rooted crops, such as corn and alfalfa, can grow well on many of the soils that have a perched water table during part of the growing season.

9. Carthage-Enet

Deep, moderately well drained and well drained, nearly level to undulating loamy soils formed in glacial outwash on uplands and upland terraces

This map unit is in areas mantled by glacial outwash sediments underlain by glacial drift or glacial till. Many swales and a few closed depressions are in most areas. Slopes typically are short and convex. They commonly are nearly level to undulating. They are mostly nearly level on outwash terraces where local relief is low, and they are gently rolling or steeper along some of the more prominent drainageways. The drainage pattern is well defined throughout most of the unit but is poorly defined in some of the nearly level areas.

This map unit makes up about 3 percent of the county. It is about 35 percent Carthage soils, 25 percent Enet soils, and 40 percent minor soils.

The moderately well drained Carthage soils are in convex to slightly concave areas. The surface layer is very dark gray fine sandy loam, and the subsurface layer and subsoil are very friable fine sandy loam. The underlying material to a depth of 32 inches is loamy fine sand. Below this is calcareous clay loam. Available water capacity is moderate or high. A perched water table is within a depth of 4 feet early in the growing season. Permeability is moderately rapid in the upper part of the soils and moderately slow in the underlying clay loam. The shrink-swell potential is moderate in the underlying clay loam.

The well drained Enet soils are on outwash terraces. They are mostly nearly level and have a plane to slightly convex surface. They have a dark grayish brown loam surface layer and a friable loam and sandy loam subsoil and are underlain by calcareous gravelly sand. Available water capacity is moderate. Permeability is moderate through the subsoil and rapid in the underlying material. The shrink-swell potential is low.

Minor in this map unit are the well drained Blendon soils intermingled with Carthage soils; the somewhat excessively drained Delmont soils and excessively drained Talmo soils in places where sand and gravel are within a depth of 20 inches; the somewhat poorly drained Elsmere soils and poorly drained Loup soils in swales and low areas near Carthage soils; the Ethan and Hand soils on some of the higher ridges and on the shoulders of entrenched drainageways; the poorly drained Grat soils and moderately well drained Spottswood soils in swales near Enet soils; and the poorly drained Hoven and Tetonka soils in closed depressions. Blendon, Elsmere, and Loup soils lack clay loam within a depth of 40 inches. Ethan and Hand soils formed in loamy glacial drift.

About 70 percent of the acreage of this map unit is used for crops and for tame pasture and hayland. Corn, small grain, and alfalfa are the main crops. Some of the steeper soils and some of the poorly drained soils remain in native grass and are used for range or hay. Runoff is slow throughout much of the unit. Enet soils are somewhat droughty. Controlling soil blowing, conserving moisture, and maintaining tilth and fertility are the main concerns if the soils in this unit are cropped.

The major soils in this map unit have good potential for range, rangeland wildlife habitat, and most recreation uses and fair to good potential for crops, tame pasture and hayland, and openland wildlife habitat. The potential for windbreaks and environmental plantings is good on the Carthage soils and poor on the Enet soils. The Carthage soils have fair to poor potential and the Enet soils good potential for most urban uses. Deep-rooted crops, such as corn and alfalfa, grow well on the Carthage soils because of the perched water table, but small grain is better suited than corn on the Enet soils. The Enet soils respond well to irrigation.

Moderately well drained soils formed in alluvium

This group consists of deep, moderately well drained silty soils mainly on bottom land and low terraces along creeks and drainageways on the west side of the county. Slopes are mostly nearly level and commonly are broken by channels and meander scars. Many of the soils are subject to flooding.

These soils make up less than 2 percent of the county. About 70 percent of the acreage is used for crops and for tame pasture and hayland. Channeled areas and the poorly drained minor soils remain in native grass and are used for range and wildlife habitat. The major soils have few limitations for crops, but they are subject to stream flooding in some years and lack summer moisture in dry years.

10. Lane

Deep, moderately well drained, nearly level silty soils formed in alluvium on upland flats, alluvial fans, and low terraces

This map unit is along drainageways on the foot slopes of the Wessington Hills. Slopes are mostly nearly level and are plane. Meandering creek channels are in most areas.

This map unit makes up less than 1 percent of the county. It is about 70 percent Lane soils and 30 percent minor soils.

Lane soils have a surface layer of dark gray silt loam and a subsoil of firm silty clay. The underlying material is calcareous silty clay and silty clay loam. Fertility is high. Available water capacity is moderate or high, but the clayey subsoil takes in water slowly and releases moisture slowly to plants. Permeability is moderately slow or slow. The subsoil shrinks and swells markedly upon drying and wetting.

Minor in this map unit are the moderately well drained Dudley and Jerauld soils on some of the flats and terraces and the Houdek soils in convex upland areas. Dudley and Jerauld soils have a claypan subsoil and contain more sodium than Lane soils. Houdek soils have a friable clay loam subsoil.

About 70 percent of the acreage of this map unit is used for crops and tame pasture or hayland. Corn, small grain, and alfalfa are the main crops. Small areas, mainly of Dudley and Jerauld soils, remain in native grass and are used for range or hayland. Improving water intake, conserving moisture, and controlling soil blowing are the main concerns if the soils in this unit are cropped.

Lane soils have good potential for crops, tame pasture and hayland, range, windbreaks and environmental plantings, and openland and rangeland wildlife habitat. They have fair to good potential for recreation uses and poor potential for most urban uses.

11. LaDelle-Lane-Mobridge

Deep, moderately well drained, nearly level silty soils formed in alluvium on bottom land and low terraces

This map unit is along Turtle Creek in the northwest corner of the county. Slopes are mostly nearly level and are plane to slightly concave. Channels and meander scars dissect this narrow area into small parcels. Most of the area is subject to stream flooding.

This map unit makes up less than 1 percent of the county. It is about 40 percent LaDelle soils, 10 percent Lane soils, 10 percent Mobridge soils, and 40 percent minor soils.

The major soils have a surface layer of dark gray silt loam. LaDelle soils have calcareous silt loam underlying material. Lane soils have a firm silty clay subsoil and calcareous silty clay and silty clay loam underlying material. Mobridge soils have a friable silty clay loam subsoil and calcareous silty clay loam underlying material.

Fertility is high in the major soils. Available water capacity is high or moderate. The LaDelle soils have a seasonal water table at a depth of 4 to 6 feet early in the growing season. Permeability is moderate in the LaDelle and Mobridge soils and moderately slow or slow in the Lane soils. The shrink-swell potential is moderate or high.

Minor in this map unit are the loamy Bon soils along some of the channels; the Delmont and Enet soils that are on terraces and are underlain by sand and gravel; the Dudley and Jerauld soils on some of the terraces; the poorly drained Durrstein and Egas soils in low, wet areas; and the well drained Houdek soils on the edges of the unit. The Dudley and Jerauld soils have a claypan subsoil and contain more sodium and other salts than the major soils of the unit.

About 70 percent of the acreage of this map unit is used for crops and for tame pasture and hayland. Corn, small grain, and alfalfa are the main crops. Small areas, mostly of minor soils, remain in native vegetation and are used for range or hayland. Flooding delays spring planting in some years. Conserving moisture and maintaining tilth and fertility are the main concerns if the major soils are cropped. Improving water intake is a management concern on the Lane soils and some of the minor soils.

The major soils in this map unit have good potential for crops, tame pasture and hayland, range, windbreaks and environmental plantings, and openland wildlife habitat. They have fair to poor potential for most recreation and urban uses.

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 profiles that are 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. Beadle and Carthage, for example, are the names of two soil series.

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, Beadle loam, 0 to 2 percent slopes, is one of several phases within the Beadle series.

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. Pits, gravel, 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.

Ao—Aquolls. This map unit consists of deep, very poorly drained, level soils in shallow lakes or marshy areas of closed depressions. Individual areas are irregular in shape and range from 5 to 30 acres in size. They are covered by water during much of the growing season in most years. During wet years the open water is as much as 3 feet deep. The water areas generally become dry during extended periods of drought.

Typically, the surface soil is very dark gray loam, but it ranges from fine sandy loam to clay. In places it is covered by a thin layer of organic matter and partly decomposed plant remains. The underlying material ranges from fine sand to clay and commonly is stratified by finer or coarser material.

These wet soils generally are medium in fertility and moderate to high in content of organic matter. Permeability is moderate to slow. In most areas the shrink-swell potential is moderate to high. The water table is near, at, or above the surface. Runoff is ponded.

Most areas are used as wildlife habitat. The soils have good potential for wetland wildlife habitat and poor potential for range and rangeland wildlife habitat. They generally are not suited to crops, tame pasture and hayland, windbreaks and environmental plantings, and most recreation and engineering uses.

These soils are best suited to wetland wildlife habitat. The native vegetation commonly consists of aquatic plants, such as cattails, rushes, and sedges. Constructing level ditches or shallow pits to provide open water enhances the habitat for wetland wildlife in those areas that lack bodies of open water.

These soils are poorly suited to range. Tall, coarse grasses are in the less wet areas, but typically less than 50 percent of the vegetation is suitable for grazing by domestic livestock. The soils are suited to dugouts excavated to provide livestock water.

These soils are too wet for buildings and waste disposal systems. Roads can be constructed across areas of these soils if grade material and base material are hauled in from outside the areas, but maintenance is difficult because of damage caused by shrinking and swelling of the soils and by frost action. Building roads and streets around the areas of these soils is generally less costly. Capability unit VIIIw-1; not assigned to a range site.

BaA—Beadle loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on uplands. Areas are irregularly shaped and range from 25 to several hundred acres in size. Slopes are long and smooth and are plane to slightly convex.

Typically, the surface layer is dark gray loam about 7 inches thick. The subsoil is about 23 inches thick. It is dark grayish brown, firm clay loam and clay in the upper part and grayish brown, calcareous clay in the lower part. The lower part has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray and grayish brown, calcareous clay loam. On some of the lower parts of the landscape, the subsoil is darker colored when moist than is typical for Beadle soils. On some of the slight rises, it is light clay loam or loam.

Included with this soil in mapping are small areas of Dudley, Hoven, Jerauld, Stickney, and Tetonka soils.

These soils make up about 15 percent of most areas. The moderately well drained Dudley, Jerauld, and Stickney soils are in swales and along drainageways. These soils have a claypan subsoil and contain more sodium than the Beadle soil. The poorly drained Hoven and Tetonka soils are in closed depressions.

This soil is medium in fertility and moderate in content of organic matter. Available water capacity is high, but the clayey subsoil takes in water slowly and releases moisture slowly to plants. The surface layer is easy to work but tends to crust after hard rains. Excessive tillage when the soil is wet causes the subsoil to compact. Permeability is moderately slow. The subsoil shrinks and swells markedly upon drying and wetting. Runoff is slow.

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

This soil is well suited to small grain and alfalfa and moderately well suited to corn. Conserving moisture, controlling soil blowing, and improving water intake are the main concerns if this soil is cropped. Stubble mulching or crop residue management and chiseling or subsoiling help conserve moisture, reduce the risk of soil blowing, and improve water intake. Field windbreaks and wind stripcropping help to control soil blowing. Use of grasses and legumes in the cropping system, minimum tillage, and timely tillage help 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, weed control, and applications of fertilizer help keep the pasture in good condition.

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. A planned grazing system that includes proper grazing use and deferred grazing helps to maintain or improve the range condition. Proper location of watering sites helps to obtain uniform grazing.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. This soil is well suited to sewage lagoons. Enlarging the absorption area helps to overcome the slow percolation rate if the soil is used as a septic tank filter field. The soil is well suited to area-type landfills, but trafficability is poor because the subsoil is clayey. The poor trafficability is a problem if daily cover is applied when the soil is wet. Excavating trench-type landfills is difficult when the soil is wet. All-weather service roads facilitate the use of this soil for landfills.

Local roads and streets constructed on this soil should be graded to shed water, and the base material should be strengthened or replaced in order to support vehicular traffic. Capability unit IIs-1; Clayey range site.

BaB—Beadle loam, 2 to 6 percent slopes. This deep, well drained, undulating soil is along shallow drainageways and on low ridges and knolls in the uplands. Slopes are plane to convex and are broken by swales, closed depressions, and drainageways. The areas adjacent to drainageways generally are long and narrow, but other areas are irregular in shape. Individual areas range from 10 to several hundred acres in size.

Typically, the surface layer is dark gray loam about 7 inches thick. The subsoil is about 23 inches thick. It is dark grayish brown, firm clay loam and clay in the upper part and grayish brown, calcareous clay in the lower part. The lower part has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray and grayish brown, calcareous clay loam. On foot slopes and in swales, the surface layer is thicker than is typical for Beadle soils and the subsoil is darker colored when moist. In some places on the higher parts of the landscape, the subsoil is light clay loam or loam.

Included with this soil in mapping are small areas of Dudley, Hoven, Stickney, and Tetonka soils. These soils make up less that 15 percent of any one mapped area. The moderately well drained Dudley and Stickney soils are in swales and along drainageways. They have a claypan subsoil and contain more sodium than the Beadle soil. The poorly drained Hoven and Tetonka soils are in closed depressions

This soil is medium in fertility and moderate in content of organic matter. Available water capacity is high, but the clayey subsoil takes in water slowly and releases moisture slowly to plants. The surface layer is easy to work, but it tends to crust after hard rains. The soil dries slowly, and working the soil when it is wet causes the subsoil to compact. Permeability is moderately slow. The subsoil shrinks and swells markedly upon drying and wetting. Runoff is medium.

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

This soil is well suited to small grain and alfalfa and moderately well suited to corn. Controlling erosion and conserving moisture are the main management concerns if this soil is cropped. Controlling soil blowing, improving water intake, and maintaining tilth and fertility also are important. Stubble mulching or crop residue management, minimum tillage, and grassed waterways help to control erosion and conserve moisture. Slopes in most areas are too irregular for contour farming and terracing. Field windbreaks and wind stripcropping help control soil blowing. Use of grass and legumes in the cropping system and timely tillage help maintain fertility and tilth. Chiseling or subsoiling improves water intake.

Using this soil for tame pasture or hayland is effective in controlling erosion. All climatically suited pasture plants grow well. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help keep the pasture in good condition.

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 productive grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing helps to maintain or improve the range condition. Proper location of watering sites helps to insure uniform grazing.

This soil is moderately well suited to trees and shrubs grown as windbreaks and environmental plantings. Tree height is somewhat less than on more favorable soils. A year of fallow prior to planting controls weeds and stores moisture for tree growth.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help prevent structure damage caused by shrinking and swelling. Sewage lagoons function well on this soil, but some landshaping is needed because of the slope. Enlarging the absorption area helps to overcome the slow percolation rate in septic tank filter fields. Excavation for trench-type landfills is difficult when the soil is wet, but the soil is well suited to area-type landfills. All-weather service roads in landfill areas help to overcome the poor trafficability of the soil.

Grading local roads and streets to shed water and strengthening or replacing the base material help to overcome the low strength of this soil for supporting vehicular traffic. Capability unit IIIe-3; Clayey range site.

BaC—Beadle loam, 6 to 9 percent slopes. This deep, well drained, gently rolling soil is on the sides of ridges and drainageways in the uplands. Slopes are mostly short and convex. Individual areas are mostly long and narrow and range from 10 to 50 acres in size.

Typically, the surface layer is dark gray loam about 6 inches thick. The subsoil is about 20 inches thick. It is dark grayish brown, firm clay loam and clay in the upper part and grayish brown, calcareous clay in the lower part. The lower part has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray and grayish brown, calcareous clay loam. On some of the foot slopes, the surface layer is thicker than is typical for Beadle soils and the subsoil is darker colored when moist. In places the subsoil is light clay loam or loam.

Included with this soil in mapping are small areas of Betts soils. These soils make up about 10 percent of some areas. They are on some of the ridgetops or at the head of drainageways. They are calcareous at or near the surface and are low in fertility.

This soil is medium in fertility and moderate in content of organic matter. Available water capacity is high, but the clayey subsoil takes in water slowly and releases moisture slowly to plants. The surface layer is easy to work, but it tends to crust after hard rains. The soil dries slowly, and working the soil when it is wet causes compaction of the subsoil. Permeability is moderately slow. The subsoil shrinks and swells markedly upon drying and wetting. Runoff is medium.

Most areas of this soil remain in native grass, but some areas are farmed. The soil has good potential for range, tame pasture and hayland, and rangeland wildlife habitat. It has fair potential for crops, windbreaks and environmental plantings, and most recreation uses. The potential for most engineering uses is poor.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Maintaining an adequate grass cover and ground mulch helps control erosion and conserve moisture. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing helps to maintain or improve the range condition. Proper location of watering sites helps to insure uniform grazing.

This soil is moderately well suited to small grain, alfalfa, and corn. Because the erosion hazard is severe, small grain and alfalfa are better suited than row crops. Controlling erosion and conserving moisture are the main concerns if the soil is cropped. Stubble mulching or crop residue management, minimum tillage, use of close-sown crops in the cropping system, and grassed waterways help control erosion and conserve moisture. In most areas slopes are too irregular for contour farming and terracing. Field windbreaks and wind stripcropping help reduce the risk of soil blowing. Use of grasses and legumes in the cropping system and timely tillage help maintain tilth and fertility. Chiseling or subsoiling improves water intake.

Using this soil for tame pasture and hayland is an effective way to control erosion. All climatically suited pasture plants grow well. Bunch-type species that are planted alone, however, are not suitable because of the erosion hazard. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to keep the pasture in good condition.

This soil is moderately well suited to trees and shrubs grown as windbreaks and environmental plantings. Tree height is less than on more favorable soils. A year of fallow prior to planting controls weeds and conserves moisture. Planting the trees 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 help prevent structure damage caused by shrinking and swelling. Enlarging the absorption area helps to overcome the slow percolation rate in septic tank filter fields. Landshaping is necessary before this soil can be used for sewage lagoons. If this soil is used for sanitary landfills, all-weather service roads help to overcome poor trafficability. The soil is well suited to area-type landfills, but excavation of trench-type landfills is difficult under wet conditions.

Grading local roads and streets to shed water and strengthening or replacing the base material helps to overcome the low strength of this soil for supporting vehicular traffic. Control of roadside erosion helps to prevent gullying in borrow areas. Capability unit IVe-7; Clayey range site.

BdA—Beadle-Dudley complex, 0 to 2 percent slopes. This map unit consists of deep, nearly level soils on uplands. Most areas are broad, but some are long and narrow. Individual areas range from 15 to more than 100 acres in size and are about 55 percent Beadle soils and 30 percent Dudley soils. The well drained Beadle soils are on plane to slightly convex rises. The moderately well drained Dudley soils are on the lower parts of the landscape where the surface is slightly concave. The two soils are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Beadle soil has a surface layer of dark gray loam about 8 inches thick. The subsoil is about 23 inches thick. It is dark grayish brown, firm clay loam and clay in the upper part and grayish brown, calcareous clay in the lower part. The lower part has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray and grayish brown, calcareous clay loam. In some places, the surface layer is thicker than is typical for Beadle soils and the subsoil is darker when moist. In others the subsoil is light clay loam or loam.

Typically, the Dudley soil has a surface layer of dark gray silt loam about 7 inches thick. The subsurface layer is gray silt loam about 2 inches thick. The subsoil is about 18 inches thick. It is dark grayish brown, very firm clay in the upper part and grayish brown, calcareous clay loam in the lower part. The lower part has spots and streaks of soft lime, gypsum, and other salts that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam and silty clay loam. In places the surface layer is deeper over the claypan subsoil than is typical for Dudley soils.

Included with this unit in mapping are small areas of Hoven, Jerauld, and Tetonka soils. These soils make up about 15 percent of any one mapped area. The poorly drained Hoven and Tetonka soils are in closed depressions. Jerauld soils are intermingled with the Dudley soil. They have a thinner surface layer than the Dudley soil and are not so deep over accumulations of salts.

Beadle and Dudley soils are medium in fertility and moderate in content of organic matter. Available water capacity is high or moderate, but the clayey subsoil releases moisture slowly to plants and the claypan subsoil of the Dudley soil limits the growth of plant roots. Tilth deteriorates if these soils are worked when wet, especially the Dudley soil. Permeability is moderately slow in the Beadle soil and slow to very slow in the Dudley soil. The subsoil of both soils shrinks and swells markedly upon drying and wetting.

Most areas of these soils remain in native grass and are used as range or hayland. The Beadle soil has good potential for crops, tame pasture and hayland, range, and openland and rangeland wildlife habitat. The use of this map unit, however, is limited somewhat by the Dudley soil, which has only fair potential for crops, tame pasture and hayland, and range and poor potential for wildlife habitat. The potential for windbreaks and environmental plantings is fair on the Beadle soil and poor on the Dudley soil. The Dudley soil has fair to poor potential for most recreation uses. Both soils have poor potential for most engineering uses.

These soils are 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. A planned grazing system that includes proper grazing use and deferred grazing helps to maintain or improve the range condition. Proper location of watering sites helps to insure uniform grazing.

If farmed, these soils are better suited to small grain and alfalfa than to corn because the root zone in the Dudley soil is restricted. Conserving moisture, improving water intake, and maintaining tilth are the main concerns if the soils are farmed. Controlling soil blowing and maintaining fertility also are important. Stubble mulching and minimum tillage help conserve moisture and control soil blowing. Field windbreaks and wind stripcropping also help control soil blowing. Using grasses and legumes in the cropping system and plowing under green manure crops help to maintain tilth and fertility. Timely tillage also helps in maintaining tilth and fertility. Chiseling or subsoiling improves water intake.

Planting suitable pasture plants on these soils and maintaining a good grass cover are effective in conserving moisture, controlling soil blowing, and improving tilth. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help keep the pasture in good condition.

The Beadle soil is moderately well suited and Dudley soil poorly suited to trees and shrubs grown as windbreaks and environmental plantings. Growth and survival generally are poor and the number of suitable species is limited on the Dudley soil. Unless height is a critical requirement, plantings can be established if the site is properly prepared and weeds are controlled.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. Sewage lagoons and area-type landfills are suitable means of waste disposal. Enlarging the absorption area helps to overcome the slow percolation rate in septic tank filter fields, but the likelihood of success is limited on the Dudley soil. Providing all-weather service roads facilitates the use of these soils for sanitary landfills.

Grading roads and streets to shed water and strengthening or replacing the base material help to overcome the low strength of these soils for supporting vehicular traffic. Beadle soil in capability unit IIs-1, Clayey range site; Dudley soil in capability unit IVs-2, Claypan range site.

BeD—Betts stony loam, 6 to 40 percent slopes. This deep, excessively drained, gently rolling to steep, stony soil is on the sides of ridges and entrenched drainageways in the uplands. Slopes are mostly short and convex. Many scattered stones commonly are on and below the surface. Individual areas are long and narrow and range from 20 to several hundred acres in size.

Typically, the surface layer is dark grayish brown stony loam about 5 inches thick. The subsoil is about 4 inches of grayish brown, friable stony loam. The underlying material to a depth of 60 inches is light brownish gray clay loam. The entire profile is calcareous. In places, the surface layer is more than 5 inches thick and lime is leached as deep as 9 inches.

Included with this soil in mapping are small areas of well drained Hand and Houdek soils. These soils make up less than 15 percent of any one mapped area. They are on foot slopes and some of the broader ridgetops. They have a thicker surface layer and subsoil than the Betts soil and are deeper to lime.

This soil is low in fertility and content of organic matter. Available water capacity is high, but runoff is rapid. Permeability is moderate to a depth of 27 inches and moderately slow below. The shrink-swell potential is moderate.

Most areas of this soil remain in native grass and are used for range. The soil has fair potential for range and rangeland wildlife habitat, but it has poor potential for crops, tame pasture and hayland, 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. Maintaining an adequate grass cover and ground mulch reduces the risk of erosion and increases the moisture supply available to range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less desirable range plants. A planned grazing system that includes proper grazing use and deferred grazing helps to maintain or improve the range condition and control erosion. Proper location of watering sites helps to obtain uniform grazing.

This soil is generally not suited to farming, tame pasture and hayland, and windbreaks because of the stoniness and the steep slopes. Suitable trees and shrubs grown as environmental plantings can be hand planted, but they survive and grow poorly unless given special care.

The stoniness of this soil causes some problems in excavating for buildings, roads, and other uses. If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help prevent structure damage caused by shrinking and swelling. Septic tank filter fields and sewage lagoons can be located on the lower parts of the unit where slopes are less steep. Enlarging the absorption area helps to overcome the slow percolation rate in septic tank filter fields. Sanitary landfills can be located on the less steep parts of the unit, but all-weather access roads generally are needed because the soil is sticky.

Roads and streets should be graded to shed water, and the base material should be strengthened to overcome the low strength of the soil for supporting vehicular traffic. Control of roadside erosion helps to control erosion in borrow areas. Capability unit VIIs-6; Thin Upland range site.

BfD—Betts-Ethan loams, 9 to 21 percent slopes. This map unit consists of deep, excessively drained to well drained, rolling to hilly soils on upland ridges and along entrenched drainageways. Slopes are short and convex (fig. 4). Areas are long and narrow or regularly shaped and range from 20 to several hundred acres in size. They are about 45 percent Betts soils and 40 percent Ethan soils. The Ethan soils generally are on the lower parts of the landscape below the Betts soils and on some of the broader ridgetops. The two soils are so intermingled that it was not practical to separate them in mapping.

Typically, the Betts soil has a surface layer of dark grayish brown loam about 5 inches thick. The subsoil is about 4 inches of grayish brown, friable loam. The underlying material to a depth of 60 inches is light brownish gray clay loam. The entire profile is calcareous.

Typically, the Ethan soil has a surface layer of dark gray loam about 6 inches thick. The subsoil is about 22 inches thick. The upper 3 inches is dark grayish brown, friable loam. The rest is grayish brown and light brownish gray, calcareous, friable clay loam. The underlying material to a depth of 60 inches is light gray and light brownish gray, calcareous clay loam.

Included with these soils in mapping are small areas of Hand and Houdek soils. These included soils make up 15 percent of some areas. They are on the lower parts of the landscape near the Ethan soil or are on some of the broader ridgetops. They are calcareous at a greater depth than Betts and Ethan soils.

The Betts and Ethan soils are low to medium in fertility and low to moderately low in content of organic matter. The content of lime within a depth of 10 inches affects the availability of plant nutrients. Available water capacity is high, but much of the precipitation is lost because runoff is medium to rapid. Permeability is moderate in the upper part of both soils and moderately slow in the underlying material. The shrink-swell potential is moderate.

Most areas remain in native grass and are used as range or hayland. These soils have fair to good potential for range and rangeland wildlife habitat; fair potential for tame pasture and hayland; and poor potential for crops, 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. Maintaining an adequate grass cover and ground mulch helps control erosion and increases the moisture supply available to range plants by reducing runoff. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less desirable range plants. Continued overgrazing results in considerable bare areas on the Betts soil. A planned grazing system that includes proper grazing use and deferred grazing helps maintain or improve the range condition. Proper location of watering sites helps to obtain uniform grazing.

These soils are generally not suited to crops and windbreaks because slopes are rolling to hilly and the erosion hazard is very severe. Seeding cultivated areas and other disturbed areas to range or tame pasture plants is an effective means of controlling erosion. After tame pasture is established, proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to keep the pasture in good condition. These soils are poorly suited to environmental plantings. Suitable trees and shrubs can be hand planted, but they survive and grow poorly unless given special care.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. Waste disposal systems can be located on the lower parts of the unit where slopes are less steep. Enlarging the absorption area helps to overcome the slow percolation rate in septic tank filter fields. All-weather service roads facilitate the use of these soils for sanitary landfills.

Local roads and streets should be graded to shed water, and the base material should be strengthened to overcome the low strength of these soils for supporting vehicular traffic. Control of roadside erosion generally is needed to control erosion in borrow areas and in cut and fill areas. Capability unit VIe-3; Betts soil in Thin Upland range site, Ethan soil in Silty range site.

BnA—Blendon fine sandy loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on upland terraces and alluvial fans. Areas are irregularly shaped and range from 5 to 100 acres in size. Slopes are plane to slightly concave.

Typically, the surface layer is very dark gray fine sandy loam about 10 inches thick. The subsoil is about 22 inches of dark grayish brown, friable or very friable fine sandy loam. The underlying material to a depth of 60 inches is brown loamy fine sand and fine sand. In places the surface layer and subsoil are loamy fine sand and are underlain by contrasting loamy material between depths of 40 and 60 inches.

Included with this soil in mapping are small areas of Carthage and Forestburg soils. These soils make up 15 percent of some areas. They have contrasting loamy material between depths of 20 and 40 inches and are intermingled with the Blendon soil in an erratic pattern.

This soil is medium in fertility and moderate in content of organic matter. Available water capacity is moderate. The soil is easy to work and takes in water readily. Permeability is moderately rapid. The shrink-swell potential is low. Runoff is slow.

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

This soil is well suited to corn, small grain, and alfalfa. Controlling soil blowing and conserving moisture are the main concerns of management. Stubble mulching, crop residue management, field windbreaks, and wind stripcropping help control soil blowing, conserve moisture, and maintain fertility and tilth. Grasses and legumes in the cropping system and green manure crops also help maintain fertility and tilth.

This soil is well suited to tame pasture and hayland. Seeding this soil to suited pasture plants is an effective means of controlling soil blowing and conserving moisture. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to keep the pasture in good condition.

This soil is well suited to range. The natural plant cover is a mixture of tall, mid, and short grasses. Maintaining an adequate grass cover and ground mulch helps to control soil blowing and conserves moisture for range plants. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing helps to maintain or improve the range condition. Proper location of watering sites helps to obtain uniform grazing.

Trees and shrubs grown as windbreaks and environmental plantings are well suited to this soil. All climatically suited trees and shrubs grow well. Maintaining a cover of crop residue during site preparation and in the first years after the planting is established helps to control soil blowing.

This soil is well suited as a site for buildings that have basements, but there is some danger of cutbanks caving in shallow excavations. Septic tank filter fields function well on this soil, but the effluent can pollute shallow ground water. Sealing the bottom and sides of sewage lagoons helps reduce the risk of seepage. Because of the potential seepage, this soil is poorly suited to sanitary landfills.

Strengthening the base material helps to overcome the low strength of this soil for supporting vehicular traffic. If local roads and streets are built on this soil, borrow areas should be seeded soon after construction to help control soil blowing. This soil is well suited to irrigation. Capability unit IIIe-7; Sandy range site.

Bo—Bon silt loam. This deep, moderately well drained, nearly level soil is on low terraces and bottom land. Slopes are less than 2 percent and are plane to slightly concave. Individual areas are irregular in shape and range from 4 to 40 acres in size. Flooding from stream overflow is common and of brief duration during spring and summer.

Typically, the surface layer is dark gray silt loam about 8 inches thick (fig. 5). The subsurface layer is about 23 inches of calcareous, friable silt loam. It is dark gray in the upper part and gray in the lower part. It has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray and grayish brown, calcareous clay loam. In places the soil is leached of lime to a depth of more than 16 inches.

Included with this soil in mapping are small areas of poorly drained Egas soils on some of the low parts of the landscape. These soils make up less than 10 percent of any one mapped area. They contain more salts than the Bon soil.

This soil is high in fertility and content of organic matter. Available water capacity is high or moderate. Permeability is moderate. Runoff is slow.

Some areas of this soil are farmed, and many of the small or narrow areas remain in native grass and are used for range or hay. The soil has good potential for crops, tame pasture and hayland, range, openland wildlife habitat, and windbreaks and environmental plantings. It has fair to poor potential for recreation uses and poor potential for most engineering uses.

This soil is well suited to corn, small grain, and alfalfa. Planting is delayed in some years by wetness from flooding, but in most years the additional moisture is beneficial and flood damages are minor. In most years conserving moisture and maintaining fertility and tilth are the main concerns of management. Stubble mulching or crop residue management and use of grasses and legumes in the cropping system conserve moisture and maintain fertility and tilth.

This soil is well suited to tame pasture and hayland. Selection of suitable pasture plants and good pasture management help maintain a good grass cover and ground mulch. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to keep the pasture in good condition.

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 plants. Kentucky bluegrass generally becomes dominant in areas that are continuously overgrazed. A planned grazing system that includes proper grazing use and uniform grazing maintains or improves the range condition.

Windbreaks and environmental plantings are well suited to this soil. Some areas, however, are too small to be used for windbreaks. All climatically suited trees and shrubs grow well. Proper site preparation and weed control help to establish the plantings and maintain growth and vigor.

This soil is suited to most recreation uses despite intermittent wetness from flooding. It should not be used for camp areas, however, unless it is adequately protected against flooding.

Potential flooding severely limits most engineering uses of this soil. Buildings and waste disposal systems can be constructed in areas that are adequately protected against flooding. Contamination of surface water and ground water is a major concern if the soil is used as a site for a waste disposal system. Sealing the bottom and sides of sewage lagoons helps reduce the risk of seepage. Roads and streets should be elevated above expected flood levels.

This soil is suitable for irrigation if the site is protected against damaging floods. Some areas are suited to water spreading for increased native or tame hay production. Capability unit IIc-3; Overflow range site.

Bx—Bon silt loam, channeled. This deep, moderately well drained, nearly level soil is on low terraces and bottom land in areas that are dissected by many meandering stream channels and old meander scars. Most areas are narrow and range to as much as several miles in length; some are as much as a half mile wide. Slopes are less than 2 percent and are plane to slightly concave. Flooding from stream overflow is common during spring and summer.

Typically, the surface layer is dark gray silt loam about 8 inches thick. The subsurface layer is about 23 inches of calcareous, friable silt loam. It is dark gray in the upper part and gray in the lower part. It has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray and grayish brown, calcareous clay loam. In places the soil is leached of lime to a depth of more than 16 inches.

Included with this soil in mapping are small areas of poorly drained Egas soils, which make up less than 10 percent of any one mapped area. These soils are in some of the low areas. They contain more salts than the Bon soil.

This soil is high in fertility and content of organic matter. Available water capacity is high or moderate. Permeability is moderate. Runoff is slow.

Most areas remain in native grass and are used for range. This soil has good potential for range, tame pasture and hayland, and environmental plantings. It has fair potential for rangeland wildlife habitat and some recreation uses and poor potential for farming and most engineering uses. In some of the channels and meander scars where water ponds, it has fair potential for wetland wildlife habitat.

This soil is well suited to range. The natural plant cover is mainly tall and mid grasses and clumps of native trees and shrubs along some of the channels. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less desirable plants. Kentucky bluegrass commonly becomes dominant in areas that are continuously overgrazed. A planned grazing system that includes proper grazing use and uniform grazing maintains or improves the range condition.

Farming with modern machinery is impractical on this soil because the narrow areas are cut into small parcels by the channels. Selected areas can be used for gardens. Applications of animal manure and fertilizer help to maintain fertility and tilth. The small parcels between the channels can be used for tame pasture if suitable pasture plants are seeded. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help keep the pasture in good condition.

Because of the meandering channels, this soil is generally not suited to windbreaks. All climatically suited trees and shrubs grow well, however, and small sites can be selected for environmental plantings. Proper site preparation helps to establish the plantings, and weed control helps to maintain the growth and vigor of the trees.

This soil is poorly suited to camp areas because of the potential flooding. It is suited to other recreation uses unless the small size of the areas and the occasional wetness from flooding are severely limiting.

Because of the flood hazard, this soil is poorly suited to buildings, roads, and waste disposal systems. The contamination of surface water and ground water is a major concern if this soil is used for septic tank filter fields, sewage lagoons, and landfills. Sealing the bottom and sides of sewage lagoons helps reduce the risk of seepage. Elevating roads and streets above expected flood levels and installing adequate culverts help to overcome the flooding. Capability unit VIw-1; Overflow range site.

CaA—Carthage fine sandy loam, 0 to 2 percent slopes. This deep, moderately well drained, nearly level soil is on uplands. Areas are irregularly shaped and range from 20 to 150 acres in size. Slopes are mostly plane to slightly concave.

Typically, the surface layer is very dark gray fine sandy loam about 8 inches thick. The subsurface layer is very dark gray, very friable fine sandy loam about 12 inches thick. The subsoil is about 7 inches of dark gray fine sandy loam. The underlying material to a depth of 32 inches is dark grayish brown loamy fine sand. Below this to a depth of 60 inches is light brownish gray and light gray, calcareous clay loam. In places the depth to the clay loam is more than 40 inches, and in a few places it is slightly less than 20 inches.

Included with this soil in mapping are small areas of Forestburg and Shue soils. These soils make up less than 15 percent of any one mapped area. Forestburg soils are on slight rises. They are more sandy than the Carthage soil. The somewhat poorly drained Shue soils are in low areas.

This soil is medium in fertility and moderate in content of organic matter. It is easy to work and takes in water readily. Available water capacity is moderate or high, and the water table is perched between depths of 2 and 4 feet in spring. Permeability is moderately rapid to a depth of 32 inches and moderately slow below. The shrink-swell potential is moderate in the underlying clay loam. Runoff is slow.

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

This soil is well suited to corn, small grain, and alfalfa. A severe soil blowing hazard and the periodic shortages of moisture common to the climate are the main concerns if the soil is farmed. Crop residue management or stubble mulching, field windbreaks, and wind stripcropping help control soil blowing and conserve moisture. Returning crop residue to the soil, using grasses and legumes in the cropping system, and planting green manure crops help maintain fertility and tilth.

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

This soil is well suited to range. The natural plant cover is a mixture 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. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites helps obtain uniform grazing.

This soil is well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Maintaining a mulch of crop residue on the surface helps control soil blowing during site preparation. Controlling weeds helps to maintain growth and vigor after the planting is established.

If buildings are constructed on this soil, proper design of foundations and footings helps prevent structure damage caused by shrinking and swelling of the underlying clay loam. Artificial drainage that reduces wetness from the seasonal high water table also helps to prevent structure damage. Enlarging the absorption area in septic tank filter fields helps to overcome the slow percolation rate in the underlying clay loam. Sealing the bottom and sides of sewage lagoons helps to reduce the risk of seepage.

Grading roads and streets to shed water and keeping moisture away from the subgrade reduce damage caused by frost action. Capability unit IIIe-7; Sandy range site.

CaB—Carthage fine sandy loam, 2 to 6 percent slopes. This deep, moderately well drained, undulating soil is on uplands. Areas are irregularly shaped and range from 20 to 200 acres in size. Slopes are convex to slightly concave and are broken by narrow, shallow swales.

Typically, the surface layer is very dark gray fine sandy loam about 8 inches thick. The subsurface layer is very dark gray, very friable fine sandy loam about 12 inches thick. The subsoil is about 7 inches of dark gray fine sandy loam. The underlying material to a depth of 32 inches is dark grayish brown loamy fine sand. Below this to a depth of 60 inches is light brownish gray and light gray, calcareous clay loam. In places the depth to the clay loam is more than 40 inches, and in a few places it is slightly less than 20 inches.

Included with this soil in mapping are small areas of Forestburg and Shue soils. These soils make up less than

15 percent of most areas. Forestburg soils are intermingled with and are more sandy than the Carthage soil. The somewhat poorly drained Shue soils are in some of the swales.

This soil is medium in fertility and moderate in content of organic matter. It is easy to work and takes in water readily. Available water capacity is moderate or high, and the water table is perched between depths of 2 and 4 feet in spring. Permeability is moderately rapid to a depth of 32 inches and moderately slow below. The shrink-swell potential is moderate in the underlying clay loam. Runoff is slow.

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

This soil is well suited to corn, small grain, and alfalfa. A severe soil blowing hazard and the periodic shortages of moisture common to the climate are the main concerns if the soil is farmed. Controlling water erosion and maintaining fertility and tilth are other management concerns. Crop residue management or stubble mulching, field windbreaks, and wind stripcropping help control soil blowing and erosion and conserve moisture. Returning crop residue to the soil, using grasses and legumes in the cropping system, and planting green manure crops help maintain fertility and tilth.

Seeding this soil to suited tame pasture plants is an effective means of controlling soil blowing. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites helps obtain uniform grazing.

This soil is well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Maintaining a mulch of crop residue on the surface helps to control soil blowing during site preparation. Controlling weeds helps to maintain growth and vigor after the planting is established.

If buildings are constructed on this soil, proper design of foundations and footings helps prevent structure damage caused by shrinking and swelling of the underlying clay loam. Artificial drainage that reduces wetness from the seasonal high water table also helps prevent structure damage. Enlarging the absorption area in septic tank filter fields helps to overcome the slow percolation rate in the underlying clay loam. Sealing the bottom and sides of sewage lagoons helps reduce the risk of seepage.

Grading roads and streets to shed water and keeping moisture away from the subgrade reduce damage caused by frost action. Revegetating borrow areas and cut and fill areas soon after construction helps to control soil blowing. Capability unit IIIe-8; Sandy range site.

CaC—Carthage fine sandy loam, 6 to 9 percent slopes. This deep, moderately well drained, gently rolling soil is on the sides of knolls and drainageways in the uplands. Most areas are long and narrow and range from 10 to 120 acres in size. Slopes are short and convex.

Typically, the surface layer is very dark gray fine sandy loam about 8 inches thick. The subsurface layer is very dark gray, very friable fine sandy loam about 12 inches thick. The subsoil is about 7 inches of dark gray fine sandy loam. The underlying material to a depth of 32 inches is dark grayish brown loamy fine sand. Below this to a depth of 60 inches is light brownish gray and light gray, calcareous clay loam. In places the depth to the clay loam is more than 40 inches, and in a few places it is slightly less than 20 inches.

Included with this soil in mapping are small areas of Betts, Ethan, and Hand soils, which make up less than 15 percent of most areas. These well drained soils are on the higher parts of the landscape. They contain less sand than the Carthage soil.

This soil is medium in fertility and moderate in content of organic matter. It is easy to work and takes in water readily. Available water capacity is moderate or high, and the water table is perched between depths of 2 and 4 feet in spring. Permeability is moderately rapid to a depth of 32 inches and moderately slow below. The shrink-swell potential is moderate in the underlying clay loam. Runoff is medium.

Most areas of this soil remain in native grass and are used as range and hayland. The soil has good potential for range, tame pasture and hayland, windbreaks and environmental plantings, rangeland wildlife habitat, and most recreation uses. It has fair potential for crops and fair to poor potential for most engineering uses.

This soil is 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. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites helps obtain uniform grazing.

This soil is moderately well suited to corn, small grain, and alfalfa. A severe soil blowing hazard, a moderate water erosion hazard, and the periodic shortages of moisture common to the climate are the major concerns if the soil is farmed. Crop residue management or stubble mulching, field windbreaks, and wind stripcropping help control soil blowing and erosion and conserve moisture. Slopes generally are too irregular for contour farming and terracing. Returning crop residue to the soil, using grasses and legumes in the cropping system, and planting green manure crops help maintain fertility and tilth.

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

This soil is well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Maintaining a mulch of crop residue on the surface helps control soil blowing and erosion during site preparation. Controlling weeds helps to maintain growth and vigor after the planting is established.

If buildings are constructed on this soil, proper design of foundations and footings helps to prevent structure damage caused by shrinking and swelling of the underlying clay loam. Artificial drainage that reduces wetness from the seasonal high water table also helps prevent structure damage. Enlarging the absorption area in septic tank filter fields helps to overcome the slow percolation rate in the underlying clay loam.

Roads and streets should be graded to shed water. Keeping moisture away from the subgrade helps to reduce the damage to roads and streets caused by frost action. Revegetating borrow areas soon after construction helps to reduce the risks of soil blowing and erosion. Capability unit IVe-8; Sandy range site.

CbA—Carthage-Blendon fine sandy loams, 0 to 2 percent slopes. This map unit consists of deep, moderately well drained and well drained, nearly level soils on uplands. Slopes are plane to slightly concave. Individual areas range from 20 to 175 acres in size and are about 50 percent Carthage soils and 35 percent Blendon soils. The two soils are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Carthage soil has a surface layer of very dark gray fine sandy loam about 8 inches thick. The subsurface layer is very dark gray, very friable fine sandy loam about 12 inches thick. The subsoil is about 7 inches of dark gray fine sandy loam. The underlying material to a depth of 32 inches is dark grayish brown loamy fine sand. Below this to a depth of 60 inches is light brownish gray and light gray, calcareous clay loam. In places the depth to clay loam is slightly less than 20 inches.

Typically, the Blendon soil has a surface layer of very dark gray fine sandy loam about 10 inches thick. The subsoil is about 22 inches of dark grayish brown, friable or very friable fine sandy loam. The underlying material to a depth of 60 inches is brown loamy fine sand and fine sand. In places the underlying material between depths of 40 and 60 inches is clay loam.

Included with these soils in mapping are small areas of Elsmere, Forestburg, and Shue soils. These included soils make up 15 percent of some areas. The somewhat poorly drained Elsmere and Shue soils are in low areas. Forestburg soils are intermingled with the Carthage soil in some areas. All of the included soils are more sandy than Blendon and Carthage soils.

The Blendon and Carthage soils are medium in fertility and moderate in content of organic matter. They are easy to work and take in water readily. Available water capacity is moderate or high, and the Carthage soil has a water table that is perched between depths of 2 and 4 feet in spring. Permeability is moderately rapid in the upper part of both soils and moderately slow in the underlying clay loam of the Carthage soil. The shrink-swell potential is moderate in the underlying clay loam of the Carthage soil. Runoff is slow.

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

These soils are well suited to corn, small grain, and alfalfa. A severe soil blowing hazard and the periodic moisture shortages common to the climate are the main concerns if the soils are farmed. Crop residue management or stubble mulching, field windbreaks, and wind stripcropping help control soil blowing and conserve moisture. Returning crop residue to the soils, using grasses and legumes in the cropping system, and planting green manure crops help maintain fertility and tilth.

Seeding this unit to suited tame pasture plants is an effective means of controlling soil blowing. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites helps obtain uniform grazing.

If buildings are constructed on these soils, proper design of foundations and footings helps prevent structure damage caused by shrinking and swelling of the underlying clay loam in the Carthage soil. Measures that improve drainage also help prevent structure damage caused by wetness in the Carthage soil. Septic tank filter fields function well on the Blendon soil. Enlarging the absorption area helps to overcome the slow percolation rate in the underlying clay loam of the Carthage soil. Sealing the bottom and sides of sewage lagoons helps reduce the risk of seepage. The effluent from waste disposal systems installed on these soils can pollute ground water. Therefore, each site should be carefully evaluated.

Grading roads and streets to shed water and keeping moisture away from the subgrade reduce the risk of damage caused by frost action. Capability unit IIIe-7; Sandy range site.

CbB—Carthage-Blendon fine sandy loams, 2 to 6 percent slopes. This map unit consists of deep, moderately well drained and well drained, undulating soils on uplands. Slopes are short and are convex to concave. Areas are irregularly shaped and range from 20 to 200 acres in size.

They are about 55 percent Carthage soils and 30 percent Blendon soils. The two soils are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Carthage soil has a surface layer of very dark gray fine sandy loam about 8 inches thick. The subsurface layer is very dark gray, very friable fine sandy loam about 12 inches thick. The subsoil is about 7 inches of dark gray fine sandy loam. The underlying material to a depth of 32 inches is dark grayish brown loamy fine sand. Below this to a depth of 60 inches is light brownish gray and light gray, calcareous clay loam. In places the depth to clay loam is slightly less than 20 inches.

Typically, the Blendon soil has a surface layer of very dark gray fine sandy loam about 10 inches thick. The subsoil is about 22 inches of dark grayish brown, friable or very friable fine sandy loam. The underlying material to a depth of 60 inches is brown loamy fine sand and fine sand. In places the underlying material between depths of 40 and 60 inches is clay loam.

Included with these soils in mapping are small areas of Elsmere, Forestburg, and Shue soils. These included soils make up 15 percent of some areas. The somewhat poorly drained Elsmere and Shue soils are in low areas. Forestburg soils are intermingled with the Carthage soil in some areas. All of the included soils are more sandy than Blendon and Carthage soils.

The Blendon and Carthage soils are medium in fertility and moderate in content of organic matter. They are easy to work and take in water readily. Available water capacity is moderate or high, and the Carthage soil has a water table that is perched between depths of 2 and 4 feet in spring. Permeability is moderately rapid in the upper part of both soils and moderately slow in the underlying clay loam of the Carthage soil. The shrink-swell potential is moderate in the underlying clay loam of the Carthage soil. Runoff is slow.

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

These soils are well suited to corn, small grain, and alfalfa. A severe soil blowing hazard and the periodic shortages of moisture common to the climate are the main concerns if these soils are farmed. Controlling water erosion and maintaining fertility and tilth are other management concerns. Crop residue management or stubble mulching, field windbreaks (fig. 6), and wind stripcropping help control soil blowing and water erosion and conserve moisture. Returning crop residue to the soil, using grasses and legumes in the cropping system, and planting green manure crops help 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, weed control, and applications of fertilizer 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. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites helps obtain uniform grazing.

If buildings are constructed on these soils, proper design of foundations and footings helps prevent structure damage caused by shrinking and swelling of the underlying clay loam in the Carthage soil. Measures that improve drainage also help prevent structure damage caused by wetness in the Carthage soil. Septic tank filter fields function well on the Blendon soil. Enlarging the absorption area of the septic tank filter fields helps to overcome the slow percolation rate in the underlying clay loam of the Carthage soil. Sealing the bottom and sides of sewage lagoons helps reduce the risk of seepage. The effluent from waste disposal systems installed on these soils can pollute ground water. Therefore, each site should be carefully evaluated.

Grading roads and streets to shed water and keeping moisture away from the subgrade help reduce the risk of damage caused by frost action. In areas that are disturbed during road construction, revegetating as soon as possible helps to control soil blowing. Capability unit IIIe-8; Sandy range site.

DaB—Davis loam, 2 to 9 percent slopes. This deep, moderately well drained, gently sloping to moderately sloping soil is on foot slopes, alluvial fans, and high bottom land. Most areas receive some runoff from adjacent soils, but flooding occurs only on the lower parts of some areas. Individual areas are irregular in shape and range from 5 to 40 acres in size. Slopes are plane to concave. They are mostly less than 6 percent but range to 9 percent in some areas.

Typically, the surface layer is dark grayish brown loam about 7 inches thick. The subsoil is about 32 inches thick. It is dark grayish brown, friable loam in the upper part; grayish brown loam in the next part; and dark grayish brown, calcareous clay loam in the lower part. The underlying material to a depth of 60 inches is grayish brown, calcareous clay loam. In places the soil is calcareous at the surface or within 20 inches of the surface.

This soil is high in fertility and content of organic matter. Available water capacity is high. Permeability is moderate. Runoff is medium. The shrink-swell potential is moderate.

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

This soil is well suited to corn, small grain, and alfalfa. A moderate erosion hazard is the main concern if the soil is farmed. Conserving moisture and maintaining fertility and tilth are other management concerns. Crop residue management or stubble mulching, contour farming, terracing, and grassed waterways help to control erosion and conserve moisture. Returning crop residue to the soil and using grasses and legumes in the cropping system help to maintain fertility and tilth.

This soil is well suited to tame pasture and hayland. Selection of suitable pasture plants and good pasture management help to reduce soil and water losses. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to keep the pasture in good condition.

This soil is 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. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition.

Windbreaks and environmental plantings are well suited to this soil. All climatically suited trees and shrubs can grow well. A year of fallow prior to planting, planting on the contour, and weed control help to provide the moisture needed to establish and maintain the trees.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. This soil can be used for all types of waste disposal if it is protected against flooding. Enlarging the absorption area helps to overcome the moderately slow percolation rate in septic tank filter fields. Sewage lagoons can be located on the less sloping parts of the landscape. Sealing the bottom and sides of the lagoons helps to reduce the risk of seepage.

Roads and streets should be graded to shed water, and the base material should be strengthened to support vehicular traffic. Control of roadside erosion helps to control erosion in borrow areas. Capability unit IIe-3; Silty range site.

DeA—Delmont loam, 0 to 2 percent slopes. This somewhat excessively drained, nearly level soil is on upland terraces. Areas are irregularly shaped and range from 5 to 85 acres in size. Slopes are mostly long and smooth.

Typically, the surface layer is dark gray loam about 7 inches thick. The subsoil is about 9 inches of dark grayish brown, friable loam. The underlying material to a depth of 34 inches is grayish brown, calcareous gravelly sand. Below this to a depth of 60 inches is light gray, stratified sand and gravel. In places the depth to gravelly sand or sand and gravel is more than 20 inches.

Included with this soil in mapping are small areas of Grat and Spottswood soils. The poorly drained Grat soils and moderately well drained Spottswood soils are in low areas. They make up 15 percent of some areas.

This soil is low in fertility and moderate in content of organic matter. It is easy to work. It takes in water readily, but it has low available water capacity and is droughty. Permeability is moderate to moderately rapid in the subsoil and rapid in the underlying material. The root zone is limited by the shallowness to sand and gravel. Runoff is slow.

Most areas of this soil are farmed. The soil has poor potential for crops, tame pasture and hayland, windbreaks and environmental plantings, and wildlife habitat. It has fair potential for range and good potential for recreation uses and some engineering uses.

Conserving moisture is the main concern if this soil is cropped. Because of droughtiness, spring-sown small grain is better suited than row crops and alfalfa. Controlling soil blowing and maintaining or improving fertility are other management concerns. Crop residue management or stubble mulching and wind stripcropping help to conserve moisture and control soil blowing. Using grasses and legumes in the cropping system helps to maintain tilth and fertility.

The droughtiness limits forage production if this soil is used for tame pasture and hayland. The choice of pasture plants is limited to drought-resistant species, such as crested wheatgrass and pubescent wheatgrass. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to keep the pasture in good condition after it is established.

This soil is moderately well suited to range. The natural plant cover is mid and short grasses. Forage production is limited by droughtiness. If the range is overgrazed, the more desirable grasses lose vigor and are replaced by less productive plants. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites helps to obtain uniform grazing.

Windbreaks are not suited to this soil because the droughtiness limits the height and survival of the planting. Environmental plantings, however, are suited if drought-resistant species are selected and the planting is frequently watered and otherwise given special care.

This soil is well suited as a site for buildings, but some caving or sloughing can occur where shallow excavations are made for basements and subsurface utility lines. Septic tank filter fields function well on this soil, but onsite evaluation is needed to determine the likelihood of polluting shallow ground water. Because of excessive seepage, alternative sites are more practical than this soil for sewage lagoons, sanitary landfills, and farm ponds.

This soil is well suited as a site for local roads and streets and is a fair source of sand and gravel for construction uses. If irrigated, it takes in water readily, but frequent applications of water are necessary to overcome the low available water capacity. Capability unit IVs-1; Shallow to Gravel range site.

DfB—Delmont-Talmo complex, 2 to 6 percent slopes. This map unit consists of somewhat excessively drained and excessively drained, undulating soils on upland terraces. Individual areas are mostly long and narrow and range from 5 to 50 acres in size. They are about 65 percent Delmont soils and 20 percent Talmo soils. The somewhat excessively drained Delmont soils are on the mid and lower parts of the landscape where slopes are moderately long. The Talmo soils are on the higher parts of the landscape where slopes are short and convex. The two soils are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Delmont soil has a surface layer of dark gray loam about 7 inches thick. The subsoil is about 9 inches of dark grayish brown, friable loam. The underlying material to a depth of 34 inches is grayish brown, calcareous gravelly sand. Below this to a depth of 60 inches is light gray, stratified sand and gravel. In places the depth to gravelly sand or sand and gravel is more than 20 inches.

Typically, the Talmo soil has a surface layer of dark gray sandy loam about 7 inches thick. The underlying material to a depth of 60 inches is light brownish gray, calcareous, loose gravelly sand over sand and gravel.

Included with this unit in mapping are small areas of Grat and Spottswood soils. The poorly drained Grat soils and moderately well drained Spottswood soils are in low areas. They make up 15 percent of some areas.

The Delmont and Talmo soils are low in fertility and moderate to moderately low in content of organic matter. They take in water readily but have low available water capacity and are droughty. Permeability is moderate to moderately rapid in the upper part of the Delmont soil and rapid in the underlying material. It is rapid in the Talmo soil. The root zone is limited because the soils are shallow or very shallow over sand and gravel. Runoff is slow.

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

Controlling soil blowing and erosion and conserving moisture are major concerns if these soils are cropped. Spring-sown small grain is better suited than row crops and alfalfa. The Talmo soil is not suited to crops because it is extremely droughty. Crop residue management or stubble mulching and wind stripcropping help to control soil blowing and erosion and conserve moisture. Green manure crops and applications of animal manure increase the content of organic matter and improve the water-holding capacity and fertility.

These soils are poorly suited to tame pasture and hayland. The Talmo soil is not suited to tame pasture plants. Unless the Talmo soil can be conveniently excluded from seeding, it is better to seed the soils to native grasses. On the Delmont soil, the choice of pasture plants is limited to drought-resistant species, such as crested wheatgrass and pubescent wheatgrass, and production is limited by droughtiness. If a tame pasture is established, proper stocking rates, rotation grazing, and weed control help to keep the pasture in good condition.

These soils are best suited to range. The natural plant cover is mainly mid and short grasses and sedges. Range production is limited by the droughtiness of the soils. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive plants. If the range is continuously overgrazed, the plant cover is sparse and a considerable number of bare areas are evident. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition.

Windbreaks are not suited to these soils. Environmental plantings are suited if the trees are watered frequently and given special care. Height seldom is satisfactory.

These soils are well suited as a site for buildings, but some caving or sloughing can occur where shallow excavations are made for basements and subsurface utility lines. Septic tank filter fields function well, but onsite evaluation is needed to determine the likelihood of polluting shallow ground water. Because of excessive seepage, alternative sites are more practical than these soils for sewage lagoons, sanitary landfills, and farm ponds.

These soils are well suited as a site for local roads and streets and are a fair to good source of sand and gravel for construction uses. Delmont soil in capability unit IVe-6, Shallow to Gravel range site; Talmo soil in capability unit VIs-4, Very Shallow range site.

Dg—Doger loamy fine sand. This deep, well drained, nearly level soil is on uplands. Areas are irregularly shaped and range from 10 to 60 acres in size. Slopes are plane to convex and are mostly less than 2 percent.

Typically, the surface layer is dark gray loamy fine sand about 6 inches thick. The subsurface layer is very dark gray, very friable loamy fine sand about 5 inches thick. The next 13 inches is dark grayish brown and grayish brown, loose loamy fine sand. The underlying material to a depth of 28 inches is grayish brown loamy fine sand. Below this to a depth of 60 inches is light brownish gray and light gray fine sand. In places the upper 30 inches is fine sandy loam.

Included with this soil in mapping are small areas of Carthage and Forestburg soils, which make up 15 percent of some areas. These soils are intermingled in an erratic pattern with the Doger soil. They have a contrasting loam layer that is 20 to 40 inches from the surface.

This soil is low in fertility and moderately low in content of organic matter. It is easy to work. It takes in water readily, but available water capacity is low. Permeability is rapid. Runoff is slow.

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

This soil is moderately well suited to corn, small grain, and alfalfa. Controlling soil blowing and conserving moisture are the main concerns if the soil is cropped. Crop residue management or stubble mulching, minimum tillage, field windbreaks, and wind stripcropping help to control soil blowing and conserve moisture. Using grasses and legumes in the cropping system and planting green manure crops improve fertility and the content of organic matter.

Seeding this soil to suited tame pasture plants is an effective means of controlling soil blowing. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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 tall and mid grasses. Maintaining an adequate grass cover and ground mulch helps to control soil blowing. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

Windbreaks and environmental plantings are well suited to this soil. All climatically suited trees and shrubs can grow well. Maintaining a good cover of crop residue during site preparation is needed to control soil blowing.

This soil is well suited as a site for buildings, but cutbanks in shallow excavations for basements and subsurface utility lines tend to cave or slough. Septic tank filter fields function well, but the effluent can contaminate shallow ground water. Alternative sites generally are more practical than this soil for sewage lagoons, sanitary landfills, and farm ponds because of excessive seepage.

This soil is well suited as a site for local roads and streets. Revegetating borrow areas after construction helps to control soil blowing. Capability unit IVe-9; Sandy range site.

DkA—Dudley-Jerauld silt loams, 0 to 3 percent slopes. This map unit consists of deep, moderately well drained, nearly level to gently undulating soils on uplands. The surface is uneven because very slight mounds rise a few inches above intervening low areas. Individual areas are irregular in shape and range from 5 to 100 acres in size. They are about 50 percent Dudley soils and 35 percent Jerauld soils. The Dudley soils generally are on mounds, and the Jerauld soils are in the slightly concave, low areas. The two soils are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Dudley soil has a surface layer of dark gray silt loam about 7 inches thick and a subsurface layer of gray silt loam about 2 inches thick. The subsoil is about 18 inches thick. It is dark grayish brown, very firm clay in the upper part and grayish brown, calcareous clay loam in the lower part. The lower part has spots and streaks of lime and gypsum that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam and silty clay loam. In places, the depth to the claypan subsoil is more than 11 inches and gypsum and other salts are deeper in the profile than is typical for Dudley soils.

Typically, the Jerauld soil has a surface layer of gray silt loam about 2 inches thick. The subsoil is about 9 inches of dark gray, firm or very firm silty clay. The lower part is calcareous and has spots and streaks of salts. The underlying material to a depth of 60 inches is grayish brown, light yellowish brown, and light brownish gray, calcareous clay loam.

Included with these soils in mapping are small areas of Davison, Hoven, and Tetonka soils. These included soils make up about 15 percent of any one mapped area. The Davison soils are on the edges of the mapped areas. They do not have a firm claypan subsoil. The poorly drained Hoven and Tetonka soils are in closed depressions.

The Dudley and Jerauld soils are medium to low in fertility and moderate in content of organic matter. Tilth is poor, and the Jerauld soil commonly is strongly alkaline within a depth of 15 inches. Available water capacity is high or moderate, but the claypan subsoil limits the growth of plant roots, water intake, and the amount of moisture released to plants. Permeability is slow or very slow. Both soils shrink and swell markedly upon drying and wetting. Runoff is slow, and water commonly collects on the Jerauld soil.

Most areas remain in native grass and are used for range. The Dudley soil has fair potential for crops, tame pasture and hayland, and range, but the use of this map unit is governed by the Jerauld soil, which has poor potential for those uses. Both soils have poor potential for windbreaks and environmental plantings, wildlife habitat, and most recreation and engineering uses.

These soils are best suited to range. The natural plant cover is mainly a mixture of mid and short grasses. Maintaining an adequate grass cover and ground mulch improves water intake and conserves moisture. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. If the range is continuously overgrazed, the Jerauld soil is bare in many areas. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

These soils are poorly suited to crops because the Jerauld soil commonly is strongly alkaline within a depth of 15 inches. Improving tilth and water intake are major concerns if the soils are cropped. Small grain and alfalfa are better suited than row crops. Stubble mulching, timely tillage, use of grasses and legumes in the cropping system, and chiseling or subsoiling help conserve moisture, control soil blowing, and improve fertility, tilth, and water intake.

Seeding these soils to tame pasture plants generally results in an uneven stand because of the strong alkalinity of the Jerauld soil. Range seeding is more practical in areas where it is not feasible to manage the Jerauld soil separately. If a tame pasture is established, proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to keep the pasture in good condition.

These soils are poorly suited to trees and shrubs grown as windbreaks and environmental plantings. Windbreaks can be grown on the Dudley soil if optimum height is not a critical requirement, but trees and shrubs grow and survive very poorly on the Jerauld soil.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. The soils are well suited to sewage lagoons, but the clayey subsoil and the slow percolation rate are problems if other methods of waste disposal are used. Enlarging the absorption area and laying septic tank filter fields in beds of coarser material help to overcome the slow percolation rate in these soils. Providing all-weather service roads facilitates the use of these soils for sanitary landfills.

Local roads and streets should be graded to shed water. Strengthening or replacing the base material helps to overcome the low strength of these soils for supporting vehicular traffic. Dudley soil in capability unit IVs-2, Claypan range site; Jerauld soil in capability unit VIs-1, Thin Claypan range site.

DsA—Dudley-Stickney silt loams, 0 to 3 percent slopes. This map unit consists of deep, moderately well drained, nearly level to very gently sloping soils on uplands. Slopes are mostly plane to slightly concave. Individual areas are irregular in shape and range from 10 to 150 acres in size. They are about 45 percent Dudley soils and 35 percent Stickney soils. The Dudley soils are on the mid and lower parts of the landscape. The Stickney soils generally are on the upper part of slight rises. The two soils are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Dudley soil has a surface layer of dark gray silt loam about 7 inches thick and a subsurface layer of gray silt loam about 2 inches thick. The subsoil is about 18 inches thick. It is dark grayish brown, very firm clay in the upper part and grayish brown, calcareous clay loam in the lower part. The lower part has spots and streaks of lime and gypsum that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam and silty clay loam.

Typically, the Stickney soil has a surface layer of dark gray silt loam about 8 inches thick and a subsurface layer of gray silt loam about 3 inches thick. Next is a 2-inch transition layer of dark gray silty clay loam having tongues of gray silt loam. The subsoil is about 19 inches thick. It is gray, firm silty clay loam in the upper part; grayish brown silty clay loam in the next part; and light brownish gray, calcareous clay loam in the lower part. The lower part has spots and streaks of lime and gypsum that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray and light yellowish brown, calcareous clay loam.

Included with these soils in mapping are small areas of Davison, Hoven, Jerauld, and Tetonka soils. These included soils make up about 20 percent of any one mapped area. The Davison soils are on the edges of some areas. They do not have a firm claypan subsoil. The poorly drained Hoven and Tetonka soils are in closed depressions. The Jerauld soils are intermingled with the Dudley soil. They have a surface layer less than 5 inches thick and have accumulations of visible salts within a depth of 16 inches.

The Dudley and Stickney soils are medium in fertility and moderate in content of organic matter. A crust forms as the soils dry after hard rains. Available water capacity is high or moderate, but the claypan subsoil limits the growth of plant roots, water intake, and the amount of moisture released to plants. Permeability is slow or very slow in the Dudley soil and slow in the Stickney soil. Both soils shrink and swell upon drying and wetting. Runoff is slow, and water tends to collect on the Dudley soil.

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

These soils are moderately well suited to crops. Small grain, sorghum, and alfalfa generally are better suited than corn. Wetness delays planting in some years, and tilth deteriorates, especially if the Dudley soil is farmed when wet. Conserving moisture, maintaining tilth and fertility, improving water intake, and controlling soil blowing are concerns if these soils are farmed. Stubble mulching or crop residue management, minimum tillage, timely tillage, and chiseling or subsoiling conserve moisture, maintain tilth, and improve water intake. Returning crop residue to the soils, using grasses and legumes in the cropping system, and planting green manure crops maintain fertility and maintain or improve tilth. Field windbreaks and wind stripcropping help to control soil blowing.

These soils are moderately well suited to tame pasture and hayland. Seeding the soils to suited tame pasture plants and maintaining a good grass cover and grass mulch improve tilth and fertility. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

The Dudley soil is poorly suited and the Stickney soil moderately well suited to trees and shrubs grown as windbreaks and environmental plantings. Tree height is less than optimum for windbreaks, and survival is poor if the windbreak is on the Dudley soil. Proper site preparation and weed control help to establish and maintain the plantings.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. The soils are well suited to sewage lagoons, but the clayey subsoil and the slow percolation rate are problems if other methods of waste disposal are used. Laying septic tank filter fields in beds of coarser material and enlarging the absorption area help overcome the slow percolation rate in these soils. Providing all-weather service roads facilitates the use of these soils for sanitary landfills.

Local roads and streets should be graded to shed water. Strengthening or replacing the base material helps to overcome the low strength of these soils for supporting vehicular traffic. Capability unit IVs-2; Dudley soil in Claypan range site, Stickney soil in Clayey range site.

DtA—Dudley-Tetonka silt loams. This map unit consists of deep, somewhat poorly drained and poorly drained, nearly level soils on flats and in swales on uplands. Some areas are long and narrow, and some are irregular in shape. Slopes are less than 2 percent and are plane to slightly concave. Individual areas range from 5 to 60 acres in size and are about 55 percent Dudley soils and 20 percent Tetonka soils. The somewhat poorly drained Dudley soils are on very slight rises only slightly above the poorly drained Tetonka soils. The Tetonka soils are in small, closed depressions throughout the unit. Both soils are subject to flooding by runoff from adjacent soils. The two soils are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Dudley soil has a surface layer of dark gray silt loam about 7 inches thick and a subsurface layer of gray silt loam about 2 inches thick. The subsoil is about 18 inches thick. It is dark grayish brown, very firm clay in the upper part and grayish brown, calcareous clay loam in the lower part. The lower part has spots and streaks of lime and gypsum that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam and silty clay loam. In places, the depth to the claypan subsoil is more than 11 inches and gypsum and other salts are deeper in the profile than is typical for Dudley soils.

Typically, the Tetonka soil has a surface layer of dark gray silt loam about 8 inches thick and a subsurface layer of gray, very friable silt loam about 6 inches thick. Next is a transitional layer of dark gray clay loam and gray silt loam about 4 inches thick. The subsoil is about 24 inches thick. It is gray, firm clay in the upper part; grayish brown clay in the next part; and grayish brown clay loam in the lower part. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam.

Included with this unit in mapping are small areas of Davison, Hoven, Jerauld, and Prosper soils. These soils make up 25 percent of some areas. The moderately well drained Davison and Prosper soils are on very pronounced rises. They contain less sodium than the Dudley soil. The Hoven soils are in depressions. They contain more sodium than the Tetonka soil. The Jerauld soils are intermingled with the Dudley soil. They have a claypan subsoil within a depth of 5 inches.

The Dudley and Tetonka soils are medium in fertility and moderate in content of organic matter. These soils have a friable surface layer, but they cannot be kept in good tilth if farmed when wet. Available water capacity is high or moderate, but the clayey subsoil limits the growth of plant roots, water intake, and the amount of moisture released to plants. Permeability is slow or very slow. Both soils shrink and swell upon drying and wetting. Runoff is slow and ponds on the Tetonka soil. The Tetonka soil has a perched water table within 5 feet of the surface.

Most areas remain in native grass and are used for range and hay. These soils have good potential for range, fair potential for tame pasture and hayland, and poor to fair potential for crops. The Tetonka soil has fair potential for wetland wildlife habitat, and if drainage is adequate, it has fair potential for openland wildlife habitat. The Dudley soil has poor potential for wildlife habitat. Both soils have poor potential for most recreation and engineering uses.

These soils are best suited to range. The natural plant cover is dominantly tall and mid grasses and sedges because extra moisture is received as runoff from adjacent soils. Some short grasses are on the Dudley soil. Maintaining a good plant cover and ground mulch improves water intake. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses and weeds. A planned grazing system that includes proper grazing use and deferment of grazing when the soils are wet maintains or improves the range condition.

These soils are poorly suited to crops unless drainage is improved. Wetness from flooding and from the water table of the Tetonka soil delays planting in spring. Late-planted forage crops are better suited than spring-sown small grain unless drainage is improved on the Tetonka soil. In wet years the undrained areas of Tetonka soil commonly cannot be farmed, but this soil is well suited to crops if drainage is adequate or has been improved. Maintaining tilth and improving water intake on the Dudley soil also are major concerns if the soils are cropped. Crop residue management or stubble mulching, grasses and legumes in the cropping system, and chiseling or subsoiling maintain fertility and tilth and improve water intake.

These soils are moderately well suited to tame pasture and hayland, especially if drainage has been improved on the Tetonka soil. Planting pasture plants best suited to the soils and maintaining a good plant cover improve water intake. Proper stocking rates, rotation grazing, avoidance of grazing when the soils are wet, and weed control help to keep the pasture in good condition.

Windbreaks and environmental plantings are poorly suited to these soils. Windbreaks can be planted on the Dudley soil if optimum tree height is not required. The Tetonka soil commonly is too wet for use of machinery during the tree-planting season unless drainage is improved. Environmental plantings can be made if the trees and shrubs are selected for the conditions at the site and the planting is given special care.

Buildings can be constructed on these soils if they are protected against flooding and the foundations and footings are designed to prevent structure damage caused by shrinking and swelling. Sewage lagoons are a satisfactory method of waste disposal. Septic tank filter fields can be located on the Dudley soil if they are protected against flooding and the absorption area is enlarged to overcome the slow percolation rate. Because of wetness, alternative sites are generally more practical than these soils for sanitary landfills.

Roads and streets should be graded above expected flood levels, and base material should be hauled in to overcome the low strength of these soils for supporting vehicular traffic. Dudley soil in capability unit IVs-2, Claypan range site; Tetonka soil in capability unit IVw-1, Closed Depression range site.

Du—Durrstein silt loam. This deep, poorly drained, nearly level soil is on bottom land along upland drainageways. It is subject to flooding. Individual areas range from 400 feet to a half mile in width and are as much as several miles long. Slopes are less than 2 percent. The surface is uneven because many small mounds rise a few inches above intervening low spots.

Typically, the surface layer is gray silt loam about 4 inches thick. The subsoil is about 16 inches of very firm or firm clay. It is dark gray in the upper part and grayish brown in the lower part. It is calcareous at a depth of 10 inches and has spots of salts and lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray and light gray, calcareous clay loam. In places the underlying material contains sand and gravel within a depth of 40 inches.

Included with this soil in mapping are small areas of Egas and Grat soils, which make up less than 15 percent of any one mapped area. These soils are in low areas. They contain less sodium than the Durrstein soil.

This soil is low in fertility and moderate in content of organic matter. Availability of plant nutrients is affected by the shallowness to salts. Tilth is poor, and the soil is difficult to work when wet. Available water capacity is moderate, but the claypan subsoil limits the growth of plant roots, water intake, and the amount of moisture released to plants. Permeability is slow or very slow. The soil shrinks and swells upon drying and wetting. The seasonal high water table fluctuates between depths of 1 foot and 6 feet in most years. Runoff is slow.

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

This soil is best suited to range. The natural plant cover is mainly salt-tolerant, tall and mid grasses. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Continuous overgrazing generally results in a plant community dominated by saltgrass and weeds and in some bare areas. A planned grazing system that includes proper grazing use and avoidance of grazing when the soil is wet maintains or improves the range condition. Proper location of watering sites promotes uniform grazing. Range seeding helps to restore range that is in poor condition.

This soil is not suited to crops because of low fertility, a high salt content, poor tilth, and wetness. Cultivated areas and other disturbed areas can be seeded to tame pasture plants and hay, but the choice of pasture plants is limited to tall wheatgrass and western wheatgrass.

Windbreaks are not suited to this soil. Environmental plantings are suited if they are given special care and the trees and shrubs that can tolerate salinity and wetness are selected.

Buildings generally should not be constructed on this soil unless they are protected against flooding and the water table is lowered. Proper design of foundations and footings helps to prevent damage caused by shrinking and swelling. Sewage lagoons can be constructed on this soil if they are protected against flooding, but alternative sites are more feasible than this soil for other methods of waste disposal.

Roads and streets should be graded above expected flood levels, and the base material should be replaced or strengthened to overcome the low strength of this soil for supporting vehicular traffic. Capability unit VIw-4; Saline Lowland range site.

Eg—Egas silty clay loam. This deep, poorly drained, nearly level soil is on bottom land along upland drainageways. It is subject to flooding in most years. Individual areas range from 400 feet to half mile in width and are as much as several miles long. Slopes are less than 2 percent and are plane to concave.

Typically, the surface layer is dark gray silty clay loam about 3 inches thick. Next is a transitional layer of gray, very firm silty clay about 15 inches thick. It is calcareous and has spots and streaks of salts and lime that extend into the underlying material. The underlying material to a depth of 46 inches is gray, calcareous silty clay loam. Below this to a depth of 60 inches is light gray, calcareous clay loam. In places the lower part of the underlying material is sand and gravel.

Included with this soil in mapping are small areas of Durrstein and Grat soils. These soils make up less than 15 percent of any one mapped area. The Durrstein soils are on slight rises. They contain more sodium than the Egas soil. The Grat soils are intermingled with the Egas soil. They contain less salts than the Egas soil and are 20 to 40 inches deep over sand and gravel.

This soil is low in fertility and moderate in content of organic matter. Availability of plant nutrients is affected by the shallowness to salts. Available water capacity is moderate, and permeability is slow. The soil shrinks and swells upon drying and wetting. Runoff is slow. The seasonal high water table fluctuates between depths of 1 foot and 5 feet in most years.

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

This soil is best suited to range. The natural plant cover is mainly salt-tolerant, tall and mid grasses. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Continuous overgrazing results in a plant community dominated by saltgrass and weeds. A planned grazing system that includes proper grazing use and avoidance of grazing when the soil is excessively wet maintains or improves the range condition. Proper location of watering sites promotes uniform grazing. Range seeding helps restore range that is in poor condition.

This soil is not suited to crops because of low fertility, a high salt content, and wetness. Cultivated areas and other disturbed areas can be seeded to tame pasture plants or hay, but the choice of pasture plants is limited to salt-tolerant species, such as tall wheatgrass and western wheatgrass.

Windbreaks are not suited to this soil. Environmental plantings are suited if they are given special care and the trees and shrubs that can tolerate salinity and wetness are selected.

Generally, locating buildings on other soils is more practical than protecting buildings on this soil against flooding and overcoming the shrink-swell potential and the wetness from the water table. Sewage lagoons can be located on this soil if they are protected against flooding, but other methods of waste disposal are not practical because of the high water table and the flooding.

Roads and streets should be graded above expected flood levels, and the base material should be strengthened or replaced to overcome the low strength of this soil for supporting vehicular traffic. Capability unit VIw-4; Saline Lowland range site.

Em—Elsmere loamy fine sand, loamy substratum. This deep, somewhat poorly drained, nearly level soil is in basins or low areas on uplands and terraces. Individual areas are irregular in shape and range from 20 to 125 acres in size. Slopes are less than 2 percent and are plane to slightly concave.

Typically, the surface layer is dark gray loamy fine sand about 8 inches thick. The subsurface layer is dark gray, very friable loamy fine sand about 10 inches thick. Next is a transitional layer of dark grayish brown loamy fine sand about 6 inches thick. The underlying material to a depth of 44 inches is grayish brown fine sand. Below this to a depth of 60 inches is dark grayish brown, calcareous clay loam. In places the clay loam is at a depth of slightly less than 40 inches.

Included with this soil in mapping are small areas of Carthage, Forestburg, and Loup soils. These soils make up 15 percent of some areas. The moderately well drained Carthage and Forestburg soils are on slight rises. They have contrasting loamy underlying material that is 20 to 40 inches below the surface. Also, the Carthage soils are less sandy than the Elsmere soil. The poorly drained Loup soils are on some of the lowest parts of the landscape.

This soil is low in fertility and moderately low in content of organic matter. It is easy to work and takes in water readily. Available water capacity is moderate. The upper part of the soil dries rapidly, and the soil tends to be too droughty for shallow-rooted crops. Deep-rooted crops, however, benefit from the water table, which fluctuates between depths of 2 and 5 feet. Permeability is rapid to a depth of 40 inches or more and moderately slow in the underlying clay loam. The shrink-swell potential is moderate in the underlying clay loam. Runoff is slow.

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

This soil is well suited to deep-rooted crops, such as corn and alfalfa, but the soil blowing hazard is severe. The high water table adversely affects crops in some wet years, but in most years the moisture from the water table is beneficial. Controlling soil blowing, conserving moisture, and improving fertility and tilth are the main concerns if the soil is cropped. Crop residue management or stubble mulching, minimum tillage, field windbreaks, and wind stripcropping help control soil blowing and conserve moisture. Returning crop residue to the soil, using grasses and legumes in the cropping system, planting green manure crops, and applying animal manure improve fertility and tilth.

Seeding this soil to tame pasture plants is an effective means of controlling soil blowing. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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 tall grasses. Maintaining a good grass cover and ground mulch helps control soil blowing and conserves moisture. If the range is overgrazed, the taller, more productive grasses lose vigor and are replaced by less productive plants. Continuous overgrazing results in bare ground and soil blowing. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

This soil is well suited to trees and shrubs grown as windbreaks and environmental plantings. Suitable species of trees that have high moisture requirements and can tolerate a high water table grow well on this soil. Maintaining a cover of crop residue on the surface during site preparation helps control soil blowing. Weed control conserves moisture for the newly planted trees.

Measures that improve drainage generally are needed if buildings are constructed on this soil. Proper design of foundations and footings helps prevent structure damage caused by shrinking and swelling of the underlying clay loam. Sewage lagoons can be constructed on this soil if the bottom and sides are adequately sealed to prevent seepage and the possible pollution of shallow ground water. Other types of waste disposal are not suited because of the high water table.

Local roads and streets should be graded well above the potential levels of surface water. Keeping moisture away from the subgrade helps prevent road damage caused by frost action. Capability unit IVe-10; Subirrigated range site.

EnA—Enet loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on upland terraces. Areas are irregularly shaped and range from 10 to 130 acres in size. Slopes are long and smooth and are plane to slightly convex.

Typically, the surface layer is dark grayish brown loam about 7 inches thick. The subsoil is about 18 inches thick. It is dark grayish brown, friable loam in the upper part; grayish brown loam in the next part; and dark brown sandy loam in the lower part. The underlying material to a depth of 60 inches is yellowish brown, brown, and light brownish gray, calcareous gravelly sand. In places sand and gravel are at a depth of slightly less than 20 inches.

Included with this soil in mapping are small areas of Grat and Spottswood soils, which make up 15 percent of some areas. The poorly drained Grat soils and moderately well drained Spottswood soils are on the lower parts of the landscape. They have a seasonal high water table.

This soil is medium in fertility, is moderate in content of organic matter, and is easy to work. Available water capacity is moderate, and the soil is somewhat droughty. Permeability is moderate in the subsoil and rapid in the underlying material. Runoff is slow.

Most areas of this soil are farmed. The soil has good potential for range, rangeland wildlife habitat, recreation, and most engineering uses. It has fair potential for crops, tame pasture and hayland, and openland wildlife habitat and poor potential for windbreaks and environmental plantings. If water is available, it has good potential for irrigation.

This soil is moderately well suited to crops. Small grain is better suited than a late-maturing crop, such as corn, because of the droughtiness. Conserving moisture is the main concern if the soil is cropped. Crop residue management or stubble mulching, minimum tillage, and wind stripcropping help to conserve moisture and control soil blowing. Returning crop residue to the soil and using grasses and legumes in the cropping system help to maintain fertility and tilth.

This soil is moderately well suited to tame pasture and hayland. Forage production is affected in dry years by the droughtiness. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to 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. Maintaining a good grass cover and ground mulch helps to conserve moisture and control soil blowing. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

Trees and shrubs grown as windbreaks and environmental plantings are poorly suited to this soil. Some trees and shrubs can be planted for those purposes, but optimum survival and growth should not be expected. Proper site preparation and weed control conserve moisture needed by the trees.

This soil is well suited as a site for buildings, but cutbanks tend to cave in excavations made for basements and subsurface utility lines. Septic tank filter fields function well, but each site should be evaluated because the effluent can pollute shallow ground water. Sealing the bottom and sides of sewage lagoons reduces the risk of seepage. Generally, the seepage cannot be controlled if the soil is used for sanitary landfills.

Roads and streets should be graded to shed water, and the base material should be strengthened to support vehicular traffic. This soil is a fair to good source of sand and gravel for construction uses. Capability unit IIIs-2; Silty range site.

EnB—Enet loam, 2 to 6 percent slopes. This deep, well drained, undulating soil is on upland terraces. Areas are irregularly shaped and range from 5 to 75 acres in size. Slopes are plane to convex and generally are short and irregular on the higher parts of the landscape.

Typically, the surface layer is dark grayish brown loam about 7 inches thick. The subsoil is about 18 inches thick. It is dark grayish brown, friable loam in the upper part; grayish brown loam in the next part; and dark brown sandy loam in the lower part. The underlying material to a depth of 60 inches is yellowish brown, brown, and light brownish gray, calcareous gravelly sand. In some places on the higher parts of the landscape, sand and gravel are at a depth of slightly less than 20 inches.

Included with this soil in mapping are small areas of Grat and Spottswood soils, which make up about 10 percent of any one mapped area. The poorly drained Grat soils and moderately well drained Spottswood soils are in swales and low areas. They have a seasonal high water table and are wetter than the Enet soil.

This soil is medium in fertility, is moderate in content of organic matter, and is easy to work. Available water capacity is moderate, and the soil is somewhat droughty. Permeability is moderate in the subsoil and rapid in the underlying material. Runoff is medium.

Most areas of this soil are farmed. The 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 moderately well suited to crops. Small grain is better suited than a late-maturing crop, such as corn, because of the droughtiness. Conserving moisture and controlling erosion are the main concerns if the soil is cropped. Crop residue management or stubble mulching, minimum tillage, and grassed waterways help to conserve moisture and control erosion and soil blowing. Contour farming also helps to control erosion where slopes are not too irregular. Wind stripcropping also helps to control soil blowing. Returning crop residue to the soil and using grasses and legumes in the cropping system help to maintain fertility and tilth.

Seeding this soil to suited tame pasture plants helps to control erosion and soil blowing. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to 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. Maintaining a good grass cover and ground mulch helps to conserve moisture and control erosion and soil blowing. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

This soil is poorly suited to windbreaks and environmental plantings because of the droughtiness. Some trees and shrubs can be planted for those purposes if optimum survival and growth are not required. Planting the trees on the contour and controlling weeds conserve moisture needed for tree growth.

This soil is well suited as a site for buildings, but cutbanks tend to cave in excavations made for basements and subsurface utility lines. Septic tank filter fields function well, but there is some danger of polluting shallow ground water. Sealing the bottom and sides of sewage lagoons reduces the risk of seepage. Generally, the seepage cannot be controlled if the soil is used for sanitary landfills.

Roads and streets should be graded to shed water. Strengthening the base material increases the ability of this soil to support vehicular traffic. The soil is a fair to good source of sand and gravel for construction uses. Capability unit IIIe-6; Silty range site.

FoA—Forestburg loamy fine sand, 0 to 3 percent slopes. This deep, moderately well drained, nearly level to gently undulating soil is on uplands. Areas are irregularly shaped and range from 5 to 90 acres in size. Slopes are slightly concave to convex.

Typically, the surface layer is dark gray loamy fine sand about 6 inches thick. The subsurface layer is dark grayish brown, very friable loamy fine sand about 13 inches thick. Next is a transitional layer of brown loamy sand about 6 inches thick. The underlying material to a depth of 29 inches is pale brown sandy loam. Below this is about 21 inches of light gray, calcareous loam over 10 inches or more of light gray, calcareous silt loam and very fine sand. In places loamy fine sand or loamy sand extends to a depth of 40 to 60 inches or more.

Included with this soil in mapping are small areas of Carthage and Shue soils. These soils make up less than 15 percent of any one mapped area. The Carthage soils are intermingled with the Forestburg soil in some areas. They contain less sand. The somewhat poorly drained Shue soils are on the low parts of the landscape.

This soil is low in fertility, is moderately low in content of organic matter, and is easy to work. Available water capacity is moderate, and the water table is perched between depths of 2 and 4 feet early in the growing season. Permeability is rapid in the upper part of the soil and moderately slow in the underlying material. The shrink-swell potential is moderate in the underlying material. Runoff is slow.

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

This soil is moderately well suited to crops. It tends to be too droughty for shallow-rooted crops, but deep-rooted crops, such as corn and alfalfa, grow well. Controlling soil blowing, conserving moisture, and improving fertility and the content of organic matter are the major concerns if the soil is farmed. Crop residue management or stubble mulching, minimum tillage, field windbreaks, and wind stripcropping help to control soil blowing and conserve moisture. Returning crop residue to the soil, using grasses and legumes in the cropping system, planting green manure crops, and applying animal manure improve fertility, tilth, and the content of organic matter.

Seeding this soil to suited tame pasture plants is an effective means of controlling soil blowing. The soil tends to be too droughty for shallow-rooted grasses, but deep-rooted grasses grow well. Maintaining a mulch of crop residue during seedbed preparation helps to control soil blowing. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to 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. Maintaining an adequate grass cover and ground mulch helps to control soil blowing and conserves moisture. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Soil blowing is a problem in places where livestock concentrate or where the range has been continuously overgrazed. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Range seeding helps to restore range that is in poor condition. Proper location of watering sites promotes uniform grazing.

This soil is well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, but survival of new plantings is poor in dry years. Maintaining a mulch of crop residue on the surface helps to control soil blowing during site preparation. Weed control conserves moisture needed for tree growth and survival.

If buildings are constructed on this soil, proper design of foundations and footings helps to prevent structure damage caused by shrinking and swelling of the underlying material. Measures that improve drainage at the building site help to prevent structure damage caused by the perched water table during spring. The seasonal high water table interferes with the functioning of septic tank filter fields and sanitary landfills. Sewage lagoons can be located on this soil if the bottom and sides of the lagoons are sealed to reduce the risk of seepage.

If roads and streets are built on this soil, keeping moisture away from the subgrade reduces damage caused by frost action. Strengthening the base material helps to overcome the low strength of this soil for supporting vehicular traffic. Capability unit IVe-9; Sandy range site.

FoB—Forestburg loamy fine sand, 3 to 6 percent slopes. This deep, moderately well drained, undulating soil is on uplands. Areas are irregularly shaped and range from 5 to 50 acres in size. Slopes are short. Most are convex, but some are concave.

Typically, the surface layer is dark gray loamy fine sand about 6 inches thick. The subsurface layer is dark grayish brown, very friable loamy fine sand about 13 inches thick. Next is a transitional layer of brown loamy sand about 6 inches thick. The underlying material to a depth of 29 inches is pale brown sandy loam. Below this is about 21 inches of light gray, calcareous loam over 10 inches or more of light gray, calcareous silt loam and very fine sand. In places loamy fine sand or loamy sand extends to a depth of 40 to 60 inches or more.

Included with this soil in mapping are small areas of Carthage and Shue soils. These soils make up less than 15 percent of any one mapped area. The Carthage soils are intermingled with the Forestburg soil in some areas. They contain less sand. The somewhat poorly drained Shue soils are in swales and low areas.

This soil is low in fertility, is moderately low in content of organic matter, and is easy to work. Available water capacity is moderate, and the water table is perched between depths of 2 and 4 feet early in the growing season. Permeability is rapid in the upper part of the soil and moderately slow in the underlying material. The shrink-swell potential is moderate in the underlying material. Runoff is slow.

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

This soil is moderately well suited to crops. It tends to be too droughty for shallow-rooted crops, but deep-rooted crops, such as corn and alfalfa, grow well. Controlling the severe soil blowing hazard, conserving moisture, and improving fertility and the content of organic matter are the major concerns if the soil is farmed. Crop residue management or stubble mulching, minimum tillage, field windbreaks, and wind stripcropping help to control soil blowing and erosion and conserve moisture. Returning crop residue to the soil, using grasses and legumes in the cropping system, planting green manure crops, and applying animal manure improve fertility and the content of organic matter.

Seeding this soil to suited tame pasture plants is an effective means of controlling soil blowing. The soil tends to be too droughty for shallow-rooted grasses, but deep-rooted pasture plants grow well. Maintaining a mulch of crop residue during seedbed preparation helps to control soil blowing. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to 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. Maintaining an adequate grass cover and ground mulch helps to control soil blowing and conserves moisture. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Soil blowing is a problem in places where livestock concentrate or where the range is continuously overgrazed. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Range seeding helps to restore range that is in poor condition. Proper location of watering sites promotes uniform grazing.

This soil is well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, but survival of new plantings is poor in dry years. Maintaining a mulch of crop residue on the surface helps to control soil blowing during site preparation. Weed control conserves moisture needed for tree growth and survival.

If buildings are constructed on this soil, proper design of foundations and footings helps to prevent structure damage caused by shrinking and swelling of the underlying material. Measures that improve drainage at the building site help to prevent structure damage caused by the perched water table during spring. The seasonal high water table interferes with the functioning of septic tank filter fields and sanitary landfills. Sewage lagoons can be located on this soil if the bottom and sides of the lagoon are sealed to reduce the risk of seepage.

If roads and streets are built on this soil, keeping moisture away from the subgrade reduces damage caused by frost action. Strengthening the base material helps to overcome the low strength of this soil for supporting vehicular traffic. Capability unit IVe-9; Sandy range site.

FrA—Forestburg-Doger loamy fine sands, 0 to 3 percent slopes. This map unit consists of deep, moderately well drained and well drained, nearly level to gently undulating soils on uplands. Slopes are slightly concave to convex. Individual areas are irregular in shape and range from 5 to 50 acres in size. They are about 45 percent Forestburg soils and 35 percent Doger soils. The two soils are in similar positions on the landscape and are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Forestburg soil has a surface layer of dark gray loamy fine sand about 6 inches thick. The subsurface layer is dark grayish brown, very friable loamy fine sand about 13 inches thick. Next is a transitional layer of brown loamy sand about 6 inches thick. The underlying material to a depth of 29 inches is pale brown sandy loam. Below this is about 21 inches of light gray, calcareous loam over 10 inches or more of light gray, calcareous silt loam and very fine sand.

Typically, the Doger soil has a surface layer of dark gray loamy fine sand about 6 inches thick and a subsurface layer of very dark gray, very friable loamy fine sand about 5 inches thick. Next are transitional layers of dark grayish brown and grayish brown, loose loamy fine sand about 13 inches thick. The underlying material to a depth of 28 inches is grayish brown loamy fine sand. Below this to a depth of 60 inches is light brownish gray and light gray fine sand.

Included with this unit in mapping are small areas of Blendon, Carthage, and Shue soils. These soils make up 20 percent of some areas. The Blendon and Carthage soils are intermingled with the Forestburg and Doger soils. They are less sandy. The somewhat poorly drained Shue soils are in low areas.

The Forestburg and Doger soils are low in fertility and moderately low in content of organic matter. Available water capacity is moderate in the Forestburg soil and low in the Doger soil. The droughtiness of these soils is offset somewhat because the Forestburg soil has a water table that is perched between depths of 2 and 4 feet early in the growing season. Permeability is rapid in the upper part of the Forestburg soil and moderately slow in the underlying material. It is rapid in the Doger soil. The shrink-swell potential is moderate in the underlying material of the Forestburg soil. Runoff is slow.

Most areas of these soils are farmed. The soils have good potential for tame pasture and hayland, range, windbreaks and environmental plantings, and rangeland wildlife habitat. They have fair potential for recreation uses and fair to poor potential for crops. The Doger soil has good potential and the Forestburg soil fair to poor potential for most engineering uses.

These soils are moderately well suited to crops. They tend to be too droughty for shallow-rooted crops, but deep-rooted crops, such as corn and alfalfa, grow well, especially on the Forestburg soil. Controlling the severe soil blowing hazard, conserving moisture, and improving fertility and the content of organic matter are the major concerns if the soils are cropped. Crop residue management or stubble mulching, minimum tillage, field windbreaks, and wind stripcropping help to control soil blowing and conserve moisture. Returning crop residue to the soils, using grasses and legumes in the cropping system, planting green manure crops, and applying animal manure improve fertility and the content of organic matter.

Seeding these soils to suited tame pasture plants is an effective means of controlling soil blowing. The soils tend to be too droughty for shallow-rooted grasses, but deep-rooted pasture plants grow well. Maintaining a mulch of crop residue during seedbed preparation helps to control soil blowing. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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 tall, mid, and short grasses. Maintaining an adequate grass cover and ground mulch helps to control soil blowing. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Soil blowing is a problem where livestock concentrate or where the range is continuously overgrazed. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing. Range seeding helps to restore range that is in poor condition.

These soils are well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, but survival of new plantings is poor in dry years. Maintaining a mulch of crop residue on the surface helps to control soil blowing during site preparation. Weed control conserves moisture needed for tree growth and survival.

If buildings are constructed on the Forestburg soil, proper design of foundations and footings helps to prevent structure damage caused by shrinking and swelling of the underlying material or by wetness from the seasonal high water table. Septic tank filter fields can be located on the Doger soil, but the wetness from the water table and the slow percolation rate of the underlying material are difficult to overcome in the Forestburg soil. Sewage lagoons can be located on the Forestburg soil if the bottom and sides of the lagoons are sealed to reduce the risk of seepage.

If roads and streets are built on the Forestburg soil, the base material should be strengthened to support vehicular traffic. Also, keeping moisture away from the subgrade reduces the likelihood of damage caused by frost action. Capability unit IVe-9; Sandy range site.

FrB—Forestburg-Doger loamy fine sands, 3 to 6 percent slopes. This map unit consists of deep, moderately well drained and well drained, undulating soils on uplands. Slopes are short. Most are convex, but some are concave. Individual areas are irregular in shape and range from 5 to 40 acres in size. They are about 50 percent Forestburg soils and 30 percent Doger soils. The two soils are in similar positions on the landscape and are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Forestburg soil has a surface layer of dark gray loamy fine sand about 6 inches thick. The subsurface layer is dark grayish brown, very friable loamy fine sand about 13 inches thick. Next is a transitional layer of brown loamy sand about 6 inches thick. The underlying material to a depth of 29 inches is pale brown sandy loam. Below this is about 21 inches of light gray, calcareous loam over 10 inches or more of light gray, calcareous silt loam and very fine sand.

Typically, the Doger soil has a surface layer of dark gray loamy fine sand about 6 inches thick and a subsurface layer of very dark gray, very friable loamy fine sand about 5 inches thick. Next are transitional layers of dark grayish brown and grayish brown, loose loamy fine sand about 13 inches thick. The underlying material to a depth of 28 inches is grayish brown loamy fine sand. Below this to a depth of 60 inches is light brownish gray and light gray fine sand.

Included with this unit in mapping are small areas of Blendon, Carthage, and Shue soils. These soils make up 20 percent of some areas. The Blendon and Carthage soils are on rises. They are less sandy than the Doger and Forestburg soils. The somewhat poorly drained Shue soils are in low areas.

The Forestburg and Doger soils are low in fertility and moderately low in content of organic matter. Available water capacity is moderate in the Forestburg soil and low in the Doger soil. The droughtiness of these soils is offset somewhat because the Forestburg soil has a water table that is perched between depths of 2 and 4 feet early in the growing season. Permeability is rapid in the upper part of the Forestburg soil and moderately slow in the underlying material. It is rapid in the Doger soil. The shrink-swell potential is moderate in the underlying material of the Forestburg soil. Runoff is slow.

Most areas of these soils are farmed. The soils have good potential for tame pasture and hayland, range, windbreaks and environmental plantings, and rangeland wildlife habitat. They have fair potential for recreation uses and fair to poor potential for crops. The Doger soil has good potential and the Forestburg soil fair to poor potential for most engineering uses.

These soils are moderately well suited to crops. They tend to be too droughty for shallow-rooted crops, but deep-rooted crops, such as corn and alfalfa, grow well, especially on the Forestburg soil. Controlling the severe soil blowing hazard, conserving moisture, and improving fertility and the content of organic matter are the major concerns if the soils are farmed. Crop residue management or stubble mulching, minimum tillage, field windbreaks, and wind stripcropping help to control soil blowing and erosion and conserve moisture. Returning crop residue to the soils, using grasses and legumes in the cropping system, planting green manure crops, and applying animal manure improve fertility and the content of organic matter.

Seeding these soils to suited pasture plants is an effective means of controlling soil blowing. The soils tend to be too droughty for shallow-rooted grasses, but deep-rooted pasture plants grow well. Maintaining a mulch of crop residue during seedbed preparation helps to control soil blowing. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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 tall, mid, and short grasses. Maintaining an adequate grass cover and ground mulch helps to control soil blowing. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Soil blowing is a problem where livestock concentrate or where the range is continuously overgrazed. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing. Range seeding helps to restore range that is in poor condition.

These soils are well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, but survival of new plantings is poor in dry years. Maintaining a mulch of crop residue on the surface helps to control soil blowing during site preparation. Weed control conserves moisture needed for tree growth and survival.

If buildings are constructed on the Forestburg soil, proper design of foundations and footings helps to prevent structure damage caused by shrinking and swelling of the underlying material or by wetness from the seasonal high water table. Septic tank filter fields can be located on the Doger soil, but the wetness from the water table and the slow percolation rate of the underlying material are difficult to overcome in the Forestburg soil. Sewage lagoons can be located on the Forestburg soil if the bottom and sides of the lagoons are sealed to reduce the risk of seepage.

Strengthening the base material helps to overcome the low strength of the Forestburg soil for supporting vehicular traffic. Also, keeping moisture away from the subgrade of roads and streets reduces the likelihood of damage caused by frost action. Capability unit IVe-9; Sandy range site.

Ga—Grat loam. This deep, poorly drained, nearly level soil is on bottom land and in swales on outwash plains. Some areas are long and narrow, and some are irregularly shaped. The areas range from 5 to 60 acres in size. Slopes are less than 2 percent and are plane or slightly concave. Most areas are subject to flooding in some years.

Typically, the surface layer is dark gray loam about 5 inches thick. The subsoil is about 15 inches of dark gray and gray, calcareous clay loam. It is firm in the upper part and has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 31 inches is white, calcareous clay loam. Below this is about 24 inches of light brownish gray, calcareous sand and gravel over 5 inches or more of light gray, calcareous clay loam. On some of the lower parts of the landscape, the soil contains more sodium and other salts than is typical for Grat soils.

Included with this soil in mapping are small areas of Enet and Spottswood soils. The well drained Enet soils and moderately well drained Spottswood soils are on slight rises or at slightly higher levels above the Grat soil. They make up 15 percent of some areas.

This soil is medium in fertility and moderate in content of organic matter. Available water capacity is moderate, and the water table fluctuates between depths of 2 and 5 feet early in the growing season. Permeability is slow in the subsoil and rapid in the underlying sand and gravel. The shrink-swell potential is high in the subsoil. Runoff is slow.

Most areas of this soil remain in native grass and are used for range or hay. The soil has good potential for range, tame pasture and hayland, and windbreaks and environmental plantings. It has fair potential for crops, wetland and rangeland wildlife habitat, and most recreation uses and poor potential for most engineering uses.

This soil is well suited to range (fig. 7). The natural plant cover is mainly tall grasses. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive plants. A planned grazing system that includes proper grazing use and deferred grazing, especially when the soil is wet, maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

This soil is moderately well suited to crops. Corn and other late-planted crops are better suited than spring-sown small grain during wet years. Wetness in spring commonly delays planting. It is the main concern if the soil is cropped. Measures that improve drainage are needed. Returning crop residue to the soil and using grasses and legumes in the cropping system help to maintain fertility and tilth.

This soil is well suited to tame pasture and hayland. All suited pasture plants grow well, but preparation of the seedbed and establishment of the planting are difficult in some years because of wetness. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to keep the pasture in good condition after it is established.

Windbreaks and environmental plantings are well suited to this soil. Trees and shrubs that have high moisture requirements grow well because of the moisture provided by the water table. Proper site preparation and weed control help to establish and maintain the plantings.

This soil is not suited as a site for camp areas unless it is protected against flooding. Measures that improve drainage help to make the soil suitable for picnic areas and playgrounds.

This soil is poorly suited as a site for buildings because of the flood hazard and wetness from the water table. If buildings are constructed, proper design of foundations and footings helps to prevent structure damage caused by shrinking and swelling of the soil. Sewage lagoons can be located on this soil if they are protected against flooding and the floor is sealed to reduce the risk of seepage. Other types of waste disposal generally are not suited because of the water table.

Roads and streets should be graded above flood levels, and the base material should be strengthened or replaced. Capability unit IVw-1; Subirrigated range site.

GbA—Great Bend silt loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on uplands. Areas are irregularly shaped and range from 10 to 70 acres in size. Slopes are long and smooth and are plane to slightly convex.

Typically, the surface layer is dark gray silt loam about 6 inches thick. The subsoil is about 14 inches of friable silt loam. It is dark grayish brown in the upper part and pale brown in the lower part. The underlying material to a depth of 52 inches is pale yellow, light gray, and white, calcareous silt loam. Below this to a depth of 60 inches is light brownish gray, calcareous silty clay loam. In places, the surface layer is more than 10 inches thick and the subsoil is dark grayish brown to a depth of 20 inches or more.

Included with this soil in mapping are small areas of Zell soils on slight rises. These soils make up less than 10 percent of any one mapped area. They are calcareous within 8 inches of the surface.

This soil is medium in fertility, is moderate in content of organic matter, and is easy to work. Available water capacity is high, and permeability is moderate. The shrink-swell potential is moderate. Runoff is slow.

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

This soil is well suited to corn, small grain, and alfalfa. The periodic shortage of moisture common to the climate is the main concern if the soil is farmed. Controlling soil blowing and maintaining tilth and fertility are other management concerns. Crop residue management or stubble mulching and minimum tillage help to conserve moisture and reduce the risk of soil blowing. Returning crop residue to the soil and using grasses and legumes in the cropping system help to maintain fertility and tilth.

This soil is well suited to tame pasture and hayland. All suited tame pasture plants grow well. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to 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. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

Trees and shrubs grown as windbreaks and environmental plantings are well suited to this soil. A year of fallow prior to planting conserves moisture needed for tree growth. Weed control also conserves moisture.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. Enlarging the absorption area helps to overcome the slow percolation rate in septic tank filter fields. Sealing the bottom and sides of sewage lagoons reduces the risk of seepage. The soil is well suited to sanitary landfills.

Roads and streets should be graded to shed water, and the base material should be strengthened to support vehicular traffic. This soil is well suited to irrigation. Capability unit IIc-2; Silty range site.

GzB—Great Bend-Zell silt loams, 2 to 6 percent slopes. This map unit consists of deep, well drained, gently sloping soils on uplands. In most areas smooth slopes are broken by shallow swales. Some areas adjacent to drainageways are long and narrow. Individual areas range from 10 to 60 acres in size and are about 65 percent Great Bend soils and 35 percent Zell soils. The Great Bend soils generally are on the mid and lower parts of the landscape. The Zell soils are on the higher parts of the landscape where slopes are short and convex. The two soils are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Great Bend soil has a surface layer of dark gray silt loam about 6 inches thick. The subsoil is about 14 inches of friable silt loam. It is dark grayish brown in the upper part and pale brown in the lower part. The underlying material to a depth of 52 inches is pale yellow, light gray, and white, calcareous silt loam. Below this to a depth of 60 inches is light gray, calcareous silty clay loam. In the swales, the surface layer is more than 10 inches thick and the subsoil is dark grayish brown to a depth of 20 inches or more.

Typically, the Zell soil has a surface layer of dark gray, calcareous silt loam about 6 inches thick. Next is a transition layer of grayish brown, very friable, calcareous silt loam about 7 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous silt loam. In some places in cultivated fields, the soil is moderately eroded and has a grayish brown or light brownish gray surface layer.

The Great Bend soil is medium in fertility and moderate in content of organic matter, but the Zell soil is low in fertility and moderately low in content of organic matter. The content of lime in the Zell soil affects the availability of plant nutrients. Available water capacity is high in both soils. Both are easy to work. Permeability is moderate. The shrink-swell potential is moderate in the Great Bend soil. Runoff is medium.

Most areas of these soils are farmed. The soils have good potential for range. Because of the Zell soil, however, the potential for crops, tame pasture and hayland, windbreaks and environmental plantings, and openland and rangeland wildlife habitat is only fair. The potential for most recreation and engineering uses is fair to good.

These soils are moderately well suited to corn, small grain, and alfalfa. Controlling erosion and soil blowing is the main concern if the soils are cropped. Crop residue management or stubble mulching, minimum tillage, contour farming, terracing, and grassed waterways help to control erosion and soil blowing and conserve moisture. Field windbreaks and wind stripcropping also help to control soil blowing. Where slopes are too irregular for contour farming, increasing the use of close-sown crops helps to control erosion. Returning crop residue to the soils and using grasses and legumes in the cropping system help to maintain fertility and tilth.

Seeding these soils to suited tame pasture plants is an effective means of reducing the risks of erosion and soil blowing. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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 a mixture of mid and short grasses. Maintaining an adequate plant cover and ground mulch reduces soil and moisture losses. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

Suitable trees and shrubs grow well on the Great Bend soil, but height and survival are less than optimum if windbreaks and environmental plantings are grown on the Zell soils. A year of fallow prior to planting and weed control before and after planting conserve moisture needed for tree growth. Planting the trees 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 structure damage caused by shrinking and swelling of the Great Bend soil. Enlarging the absorption area helps to overcome the slow percolation rate in septic tank filter fields. Sealing the bottom and sides of sewage lagoons reduces the risk of seepage. The soils are well suited to sanitary landfills.

Roads and streets should be graded to shed water, and the base material should be strengthened to support vehicular traffic. Great Bend soil in capability unit IIe-1, Silty range site; Zell soil in capability unit IVe-2, Thin Upland range site.

HaA—Hand-Bonilla loams, 0 to 3 percent slopes. This map unit consists of deep, well drained and moderately well drained, nearly level soils on uplands. Smooth slopes are broken by many narrow swales. Individual areas are irregularly shaped and range from 10 to 150 acres in size. They are about 50 percent Hand soils and 35 percent Bonilla soils. The Hand soils are on slight rises, and the Bonilla soils are in concave swales. In most years, runoff collects in the swales. The two soils are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Hand soil has a surface layer of dark grayish brown loam about 9 inches thick. The subsoil is about 20 inches thick. It is dark grayish brown and grayish brown, friable loam in the upper part and light gray, calcareous clay loam in the lower part. The lower part has spots and streaks of soft lime. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. In places the subsoil is clay loam that has a distinctly higher content of clay than the surface layer.

Typically, the Bonilla soil has a surface layer of dark gray and dark grayish brown loam about 9 inches thick. The subsoil is about 20 inches of friable loam. It is dark grayish brown and 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 soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light gray and pale yellow, calcareous clay loam. In places the subsoil is clay loam that has a distinctly higher content of clay than the surface layer.

Included with this unit in mapping are small areas of Davison, Dudley, Hoven, Stickney, and Tetonka soils. These soils make up about 15 percent of some areas. The Davison, Dudley, and Stickney soils are on foot slopes and in swales. The Davison soils have a high content of lime within a depth of 15 inches. The Dudley and Stickney soils have a claypan subsoil and contain more sodium than the Hand and Bonilla soils. The poorly drained Hoven and Tetonka soils are in small, closed depressions in some of the swales.

The Hand soil is medium in fertility and moderate in content of organic matter. The Bonilla soil is high in fertility and in content of organic matter. Both soils are easy to work. Available water capacity is high. Permeability is moderate in the subsoil of both soils and moderate or moderately slow in the underlying material of the Bonilla soil. The shrink-swell potential is moderate in both soils. Runoff is slow. The Bonilla soil has a water table that is perched between depths of 4 and 6 feet early in the growing season.

Most areas of these soils are farmed. The soils have good potential for crops, tame pasture and hayland, range, windbreaks and environmental plantings, and openland wildlife habitat. The Hand soil has good potential for rangeland wildlife habitat and most recreation uses, and the Bonilla soil has fair potential for rangeland wildlife habitat and fair to poor potential for most recreation uses. The Hand soil has fair potential and the Bonilla soil fair to poor potential for most engineering uses.

These soils are well suited to corn, small grain, and alfalfa. The periodic moisture shortage common to the climate is the main concern if the soils are cropped. In wet years, temporary wetness on the Bonilla soil delays spring plantings, but in most years the additional moisture is beneficial. Controlling soil blowing and maintaining fertility and tilth are other management concerns. Crop residue management or stubble mulching and minimum tillage conserve moisture and reduce the risk of soil blowing. Field windbreaks and wind stripcropping also help to control soil blowing. Returning crop residue to the soils and using grasses and legumes in the cropping system help to maintain fertility and tilth.

These soils are well suited to tame pasture and hayland. All suited tame pasture plants grow well. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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 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. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

Trees and shrubs grown as windbreaks and environmental plantings are well suited to these soils. A year of fallow prior to planting and weed control before and after planting conserve moisture needed for good growth and survival.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. If buildings with basements are constructed on the Bonilla soil, measures that reduce wetness from the seasonal high water table and that provide protection against flooding are needed. Septic tank filter fields can be located on the Hand soil. Enlarging the absorption area helps to overcome the slow percolation rate. Sealing the bottom and sides of sewage lagoons reduces the risk of seepage. Sanitary landfills can be located on the Hand soil.

Roads and streets should be graded to shed water, and the base material should be strengthened to support vehicular traffic. Capability unit IIc-2; Hand soil in Silty range site, Bonilla soil in Overflow range site.

HaB—Hand-Bonilla loams, 3 to 6 percent slopes. This map unit consists of deep, well drained and moderately well drained, gently sloping to undulating soils on uplands. Slopes commonly are smooth and convex on the higher parts of the landscape and are broken by numerous concave swales on the lower parts. Individual areas are irregular in shape and range from 20 to 250 acres in size. They are about 55 percent Hand soils and 30 percent Bonilla soils. The Hand soils are on the convex, mid and upper parts of the landscape. The Bonilla soils are on foot slopes and in swales. Runoff commonly collects in the swales. The two soils are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Hand soil has a surface layer of dark grayish brown loam about 9 inches thick. The subsoil is about 20 inches thick. It is dark grayish brown and grayish brown, friable loam in the upper part and light gray, calcareous clay loam in the lower part. The lower part has spots and streaks of soft lime. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. In places the subsoil is clay loam that has a distinctly higher content of clay than the surface layer.

Typically, the Bonilla soil has a surface layer of dark gray and dark grayish brown loam about 9 inches thick. The subsoil is about 20 inches of friable loam. It is dark grayish brown and 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 soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light gray and pale yellow, calcareous clay loam. In places the subsoil is clay loam that has a distinctly higher content of clay than the surface layer.

Included with this unit in mapping are small areas of Davison, Dudley, Hoven, Stickney, and Tetonka soils. These soils make up 15 percent of some areas. The Davison, Dudley, and Stickney soils are on foot slopes and in swales. The Davison soils have a high content of lime within a depth of 15 inches. The Dudley and Stickney soils have a claypan subsoil and contain more sodium than the Hand and Bonilla soils. The poorly drained Hoven and Tetonka soils are in small, closed depressions.

The Hand soil is medium in fertility and moderate in content of organic matter. The Bonilla soil is high in fertility and in content of organic matter. Both soils are easy to work. Available water capacity is high. Pemeability is moderate in the subsoil of both soils and moderate or moderately slow in the underlying material of the Bonilla soil. The shrink-swell potential is moderate. Runoff is medium, and water collects on the Bonilla soil. In places the Bonilla soil has a perched water table that fluctuates between depths of 4 and 6 feet early in the growing season.

Most areas of these soils are farmed. The soils have good potential for crops, tame pasture and hayland, range, windbreaks and environmental plantings, and openland and rangeland wildlife habitat. They have fair to good potential for most recreation and engineering uses.

These soils are well suited to corn, small grain, and alfalfa. Controlling erosion and conserving moisture are the main concerns if the soils are farmed. Controlling soil blowing and maintaining fertility and tilth are other management concerns. Contour farming, terracing, and grassed waterways help to control erosion and conserve moisture. Where slopes are too irregular for contour farming, crop residue management or stubble mulching, minimum tillage, and an increase in the use of close-sown crops in the cropping system help to control erosion. Field windbreaks and wind stripcropping help to control soil blowing. Returning crop residue to the soils and using grasses and legumes in the cropping system help to maintain fertility and tilth.

Seeding these soils to suited tame pasture plants is an effective means of controlling erosion and conserving moisture. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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 tall, mid, and short grasses. Maintaining an adequate grass cover and ground mulch helps to prevent excessive soil losses and conserves moisture. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

These soils are well suited to trees and shrubs grown as windbreaks and environmental plantings. A year of fallow prior to planting and weed control before and after planting conserve moisture needed for good growth and survival.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. On the Bonilla soil, foundations should be protected against the wetness caused by the seasonal high water table. Septic tank filter fields can be located on the Hand soil. Enlarging the absorption area helps to overcome the slow percolation rate. Sealing the bottom and sides of sewage lagoons reduces the risk of seepage. Sanitary landfills are best located on the Hand soil.

Roads and streets should be graded to shed water, and the base material should be strengthened to support vehicular traffic. Capability unit IIe-1; Silty range site.

HbC—Hand-Ethan loams, 6 to 9 percent slopes. This map unit consists of deep, well drained, moderately sloping to gently rolling soils on upland ridges and knolls or along drainageways. Slopes are moderately long and smooth in some areas and are short and convex on the higher parts of the landscape. Individual areas range from 5 to 100 acres in size and are about 50 percent Hand soils and 35 percent Ethan soils. The Hand soils are on the smoother parts of the landscape. The Ethan soils are on the tops and upper sides of convex knolls and ridges. The two soils are so intermingled that it was not practical to separate them in mapping.

Typically, the Hand soil has a surface layer of dark grayish brown loam about 7 inches thick. The subsoil is about 20 inches thick. It is dark grayish brown and grayish brown, friable loam in the upper part and light gray, calcareous clay loam in the lower part. The lower part has spots and streaks of soft lime. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. In places the subsoil is clay loam that has a distinctly higher content of clay than the surface layer.

Typically, the Ethan soil has a surface layer of dark gray loam about 6 inches thick. The subsoil is about 22 inches thick. The upper 3 inches is dark grayish brown loam, and the lower 19 inches is grayish brown and light brownish gray, calcareous clay loam. The underlying material to a depth of 60 inches is light gray and light brownish gray, calcareous clay loam. In some spots in cultivated fields, the soil is moderately eroded and plowing has mixed the surface layer and subsoil. In these spots, the surface layer is grayish brown or light brownish gray and the soil is calcareous at the surface.

Included with this unit in mapping are small areas of Delmont, Enet, Hoven, and Tetonka soils. These soils make up 15 percent of some areas. The Delmont, Enet, and Talmo soils are on knolls and ridges. They are underlain by sand and gravel. The poorly drained Hoven and Tetonka soils are in closed depressions.

The Hand and Ethan soils are medium to low in fertility and moderate to moderately low in content of organic matter. The content of lime within a depth of 9 inches in the Ethan soil affects the availability of plant nutrients. Both soils are easy to work. Available water capacity is high. Permeability is moderate in the Hand soil and the upper part of the Ethan soil and moderately slow in the underlying material of the Ethan soil. The shrink-swell is moderate in both soils. Runoff is medium.

Most areas are farmed. These soils have good potential for range, rangeland wildlife habitat, and most recreation uses. Because of the Ethan soil, the potential for crops, tame pasture and hayland, and windbreaks and environmental plantings is only fair. The potential for openland wildlife habitat is good on the Hand soil and poor on the Ethan soil. The potential for most engineering uses is fair.

These soils are moderately well suited to corn, small grain, and alfalfa. Controlling the severe erosion hazard, especially on the Ethan soil, and conserving moisture are the main concerns if the soils are farmed. Maintaining or improving fertility and controlling soil blowing also are important. Contour farming, terracing, and grassed waterways help to control erosion and conserve moisture. If those measures are not practical because slopes are short and irregular, crop residue management or stubble mulching, minimum tillage, and a decrease in the use of row crops in the cropping sytem help to reduce soil losses, conserve moisture, and control soil blowing. Returning crop residue to the soils, using grasses and legumes in the cropping system, planting green manure crops, and applying animal manure improve tilth, fertility, and the content of organic matter.

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

These soils are well suited to range (fig. 8). The natural plant cover is a mixture of tall, mid, and short grasses. Maintaining an adequate grass cover and ground mulch prevents excessive soil losses and conserves moisture. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

These soils are moderately well suited to trees and shrubs grown as windbreaks and environmental plantings. Trees grow well on the Hand soil, but the choice of species is limited and the height is less than optimum if windbreaks are planted on the Ethan soil. A year of fallow prior to planting and weed control before and after planting conserve moisture needed for tree growth. Planting the trees 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 structure damage caused by shrinking and swelling. Enlarging the absorption area helps to overcome the slow percolation rate in septic tank filter fields. Sewage lagoons can be located on the less sloping parts of the unit. The bottom and sides should be sealed to reduce the risk of seepage. The soils generally are suitable for sanitary landfills.

Roads and streets should be graded to shed water, and the base material should be strengthened to support vehicular traffic. Control of roadside erosion helps to control erosion in the borrow areas and cut areas of graded roads. Hand soil in capability unit IIIe-1, Ethan soil in capability unit IVe-3; Silty range site.

HcB—Houdek stony loam, 0 to 9 percent slopes. This deep, well drained, nearly level to gently rolling stony soil is on uplands. Individual areas range from 5 to 100 acres in size. The undulating to gently rolling slopes are short and convex. The nearly level slopes are long and smooth. Many scattered stones are on and below the surface.

Typically, the surface layer is dark gray stony loam about 7 inches thick. The subsoil is about 22 inches of friable clay loam. It is dark grayish brown in the upper part, grayish brown in the next part, and light brownish gray in the lower part. The lower part is calcareous and has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. In some of the lower areas, the subsoil is dark colored to a depth of 20 inches or more, and in places it is loam.

Included with this soil in mapping are small areas of Delmont, Enet, Hoven, Talmo, and Tetonka soils. These soils make up less than 10 percent of any one mapped area. The Delmont, Enet, and Talmo soils are on knolls and ridges. They are underlain by sand and gravel. The poorly drained Hoven and Tetonka soils are in closed depressions.

This soil is medium in fertility and moderate in content of organic matter. Available water capacity is high. Permeability is moderate in the subsoil and moderately slow in the underlying material. The shrink-swell potential is moderate. Runoff is slow to medium.

Most areas of this soil remain in native grass and are used for range. The soil has good potential for range and rangeland wildlife habitat. Because it is stony, it has poor potential for crops, tame pasture and hayland, windbreaks and environmental plantings, recreation uses, and most engineering uses.

This soil is well suited to range. The natural plant cover is a mixture of tall, mid, and short grasses. Maintaining an adequate grass cover and ground mulch helps to control erosion and conserves moisture. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

This soil is not suited to crops and tame pasture or hayland because it is stony. Removal of the stones from the surface is costly and seldom is complete because subsequent tillage and frost action bring previously buried stones to the surface. In areas where the stones are removed, crop residue management or stubble mulching and minimum tillage help to control erosion and conserve moisture if the soil is farmed.

This soil is not suited to windbreaks normally planted by machinery because of the stoniness. Other suitable types of trees and shrubs, however, grow well if they are planted by hand and given special care.

Removal of large stones generally is necessary for most engineering uses of this soil. If buildings are constructed, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling of the soil. Sewage lagoons can be located in the less sloping areas. Enlarging the absorption area helps to overcome the slow percolation rate in septic tank filter fields.

After stones are removed, roads and streets should be graded to shed water and the base material should be strengthened to support vehicular traffic. Capability unit VIIs-6; Silty range site.

HdB—Houdek-Dudley complex, 3 to 6 percent slopes. This map unit consists of deep, well drained and moderately well drained, undulating soils on uplands. Slopes are short and irregular and are broken by narrow swales and depressions. Individual areas range from 15 to 100 acres in size and are about 50 percent Houdek soils and 35 percent Dudley soils. The well drained Houdek soils are on rises where slopes are convex. The moderately well drained Dudley soils are on foot slopes and in swales where slopes are slightly concave.

Typically, the Houdek soil has a surface layer of dark gray loam about 7 inches thick. The subsoil is about 22 inches of friable clay loam. It is dark grayish brown in the upper part, grayish brown in the next part, and light brownish gray in the lower part. The lower part is calcareous and has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. In places the subsoil is dark colored to a depth of 20 inches or more.

Typically, the Dudley soil has a surface layer of dark gray silt loam about 7 inches thick and a subsurface layer of gray silt loam about 2 inches thick. The subsoil is about 18 inches thick. It is dark grayish brown, very firm clay in the upper part and grayish brown, calcareous clay loam in the lower part. The underlying material to a depth of 47 inches is light brownish gray, calcareous clay loam. Below this to a depth of 60 inches is light brownish gray, calcareous silty clay loam. In places depth to the claypan subsoil is more than 11 inches.

Included with this unit in mapping are small areas of Hoven, Jerauld, and Tetonka soils. These soils make up less than 15 percent of most areas. The poorly drained Hoven and Tetonka soils are in closed depressions. The Jerauld soils are intermingled with the Dudley soil. They have accumulations of salts within a depth of 16 inches.

The Houdek and Dudley soils are medium in fertility and moderate in content of organic matter. Available water capacity is high or moderate. Tilth is destroyed if the Dudley soil is farmed when wet. The claypan subsoil in the Dudley soil limits the growth of plant roots, water intake, and the amount of moisture released to plants. Permeability is moderate in the subsoil of the Houdek soil and moderately slow in the underlying material. It is slow or very slow in the Dudley soil. The shrink-swell potential is moderate in the Houdek soil and high in the Dudley soil. Runoff is medium, and water collects on the Dudley soil.

Most areas remain in native grass and are used for range and hay. The Houdek soil has good potential for crops, tame pasture and hayland, range, windbreaks and environmental plantings, openland and rangeland wildlife habitat, and most recreation uses. The use of this map unit, however, is governed by the Dudley soil, which has only fair potential for crops, tame pasture and hayland, and range and poor potential for windbreaks and environmental plantings, wildlife habitat, and recreation uses. The Houdek soil has fair potential and the Dudley soil poor potential for most engineering uses.

These soils are well suited to range. The natural plant cover is mainly mid and short grasses. Maintaining an adequate grass cover and ground mulch helps to prevent excessive soil losses and conserves moisture. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

These soils are moderately well suited to farming. Small grain and alfalfa are better suited than corn. Spring planting is delayed in some years because the Dudley soil dries slowly and loses its tilth if farmed when wet. Controlling erosion, conserving moisture, and improving water intake in the Dudley soil are the major concerns if the soils are farmed. Slopes generally are too short and irregular for contour farming and terracing. Crop residue management or stubble mulching, minimum tillage, and use of close-sown crops in the cropping system help to control erosion and conserve moisture. Chiseling or subsoiling improves water intake. Timely tillage, use of grasses and legumes in the cropping system, and green manure crops help to maintain tilth and fertility.

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

Suitable windbreaks and environmental plantings can grow well on the Houdek soil. On the Dudley soil, however, height is less than is desirable for windbreaks and survival is poor. A year of fallow prior to planting and weed control before and after planting conserve moisture needed for tree growth.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. Enlarging the absorption area helps to overcome the slow percolation rate in septic tank filter fields. Generally, the Houdek soil is better suited as a building site and as a site for septic tank filter fields than the Dudley soil. Sewage lagoons can be located on the less sloping parts of the unit. Earthmoving for sanitary landfills is difficult during rainy periods because of the clay content in the subsoil and underlying material.

Roads and streets should be graded to shed water, and the base material should be strengthened or replaced to support vehicular traffic. Houdek soil in capability unit IIe-2, Silty range site; Dudley soil in capability unit IVs-3, Claypan range site.

HeB—Houdek-Ethan loams, 2 to 6 percent slopes. This map unit consists of deep, well drained, undulating soils on uplands. Slopes are short and convex and are broken by swales and drainageways. Individual areas are irregular in shape and range from 5 to 50 acres in size. They are about 50 percent Houdek soils and 35 percent Ethan soils. The Houdek soils are on the mid and lower parts of the landscape. The Ethan soils are on the tops and upper sides of ridges and knolls where slopes are short and convex. Cultivated areas of Ethan soils are moderately eroded in places. The two soils are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Houdek soil has a surface layer of dark gray loam about 7 inches thick. The subsoil is about 22 inches of friable clay loam. It is dark grayish brown in the upper part, grayish brown in the next part, and light brownish gray in the lower part. The lower part is calcareous and has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. In swales and on foot slopes, the subsoil is dark colored to a depth of 20 inches or more. In places it is loam.

Typically, the Ethan soil has a surface layer of dark gray loam about 6 inches thick. The subsoil is about 22 inches thick. The upper 3 inches is dark grayish brown, friable loam, and the lower 19 inches is grayish brown and light brownish gray, calcareous clay loam. The underlying material to a depth of 60 inches is light gray and light brownish gray, calcareous clay loam. In eroded areas the surface layer is calcareous and is grayish brown or light brownish gray because plowing has mixed the surface layer and subsoil.

Included with this unit in mapping are small areas of Delmont, Enet, Hoven, Talmo, and Tetonka soils. These soils make up about 15 percent of some areas. The Delmont, Enet, and Talmo soils are on knolls. They are underlain by sand and gravel. The poorly drained Hoven and Tetonka soils are in closed depressions.

The Houdek and Ethan soils are medium to low in fertility and moderate to moderately low in content of organic matter. Availability of plant nutrients is affected by the lime content of the Ethan soil, especially in eroded areas. The soils are easy to work. Available water capacity is high. Permeability is moderate in the subsoil of both soils and moderately slow in the underlying material. The shrink-swell potential is moderate. Runoff is medium.

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

These soils are moderately well suited to corn, small grain, and alfalfa. Controlling the moderate to severe erosion hazard, conserving moisture, and improving fertility and the content of organic matter in the Ethan soil are the major concerns if these soils are farmed. Slopes generally are too short and irregular for contour farming and terracing. Crop residue management or stubble mulching, minimum tillage, and grassed waterways help to control erosion and conserve moisture. Field windbreaks and wind stripcropping help to control soil blowing. Returning crop residue to the soils, using grasses and legumes in the cropping system, planting green manure crops, and applying animal manure help to maintain or improve tilth, fertility, and the content of organic matter.

Seeding these soils to suited tame pasture plants is an effective means of controlling erosion. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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 tall, mid, and short grasses. Maintaining an adequate grass cover and ground mulch helps to control erosion and conserves moisture. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

Suited windbreaks and environmental plantings grow well on the Houdek soil. On the Ethan soil, however, survival and height of windbreaks are less than optimum. A year of fallow prior to planting and weed control before and after planting conserve moisture needed for tree growth.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. Enlarging the absorption area helps to overcome the slow percolation rate in septic tank filter fields. Sewage lagoons can be located on the less sloping parts of the unit. Earthmoving for sanitary landfills is difficult during rainy periods because of the clay content.

Roads and streets should be graded to shed water, and base material should be strengthened to support vehicular traffic. Houdek soil in capability unit IIe-2, Ethan soil in capability unit IIIe-12; Silty range site.

HeC—Houdek-Ethan loams, 6 to 9 percent slopes. This map unit consists of deep, well drained, gently rolling soils on uplands. Slopes are short and convex and are broken by swales and drainageways that dissect the landscape. Many areas are along large drainageways. Individual areas range from 5 to 100 acres in size and are about 50 percent Houdek soils and 40 percent Ethan soils. The Houdek soils are on the mid and lower parts of the landscape and on some of the broader ridgetops. The Ethan soils are on the tops and upper sides of ridges and knolls. Cultivated areas of Ethan soils are moderately eroded in places. The two soils are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Houdek soil has a surface layer of dark gray loam about 7 inches thick. The subsoil is about 22 inches of friable clay loam. It is dark grayish brown in the upper part, grayish brown in the next part, and light brownish gray in the lower part. The lower part is calcareous and has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. In places the subsoil is loam.

Typically, the Ethan soil has a surface layer of dark gray loam about 6 inches thick. The subsoil is about 22 inches thick. The upper 3 inches is dark grayish brown, friable loam, and the lower 19 inches is grayish brown and light brownish gray, calcareous clay loam. The underlying material to a depth of 60 inches is light gray and light brownish gray, calcareous clay loam. In eroded areas the surface layer is calcareous and is grayish brown or light brownish gray because plowing has mixed the surface layer and subsoil. In some grassed areas the surface layer is less than 4 inches thick.

Included with this unit in mapping are small areas of Delmont, Hoven, Talmo, and Tetonka soils. These soils make up 10 percent of some areas. The Delmont and Talmo soils are on knolls. They are underlain by sand and gravel. The poorly drained Hoven and Tetonka soils are in closed depressions.

The Houdek and Ethan soils are medium to low in fertility and moderate to moderately low in content of organic matter. Availability of plant nutrients is affected by the lime content of the Ethan soil, especially in eroded areas. The soils are easy to work. Available water capacity is high. Permeability is moderate in the subsoil of both soils and moderately slow in the underlying material. The shrink-swell potential is moderate. Runoff is medium.

Most areas are farmed. These soils have good potential for range and rangeland wildlife habitat and fair to good potential for most recreation uses. They have fair potential for crops, tame pasture and hayland, and windbreaks and environmental plantings. The potential for openland wildlife habitat is good on the Houdek soil but is poor on the Ethan soil. Both soils have fair potential for most engineering uses.

These soils are moderately well suited to farming. Close-sown crops are better suited than row crops because the erosion hazard is severe. Controlling erosion, conserving moisture, and maintaining or improving fertility and the content of organic matter are the major concerns if the soils are farmed. Slopes generally are too short and irregular for contour farming and terracing. Crop residue management or stubble mulching, minimum tillage, and grassed waterways help to control erosion and conserve moisture. Field windbreaks and stripcropping help to control soil blowing. Returning crop residue to the soils, using grasses and legumes in the cropping system, planting green manure crops, and applying animal manure maintain or improve tilth, fertility, and the content of organic matter.

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

These soils are well suited to range (fig. 9). The natural plant cover is a mixture of tall, mid, and short grasses. Maintaining an adequate grass cover and ground mulch helps to control erosion and conserves moisture. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

Suited windbreaks and environmental plantings grow well on the Houdek soil. On the Ethan soil, however, survival and height of windbreaks are less than optimum. A year of fallow prior to planting and weed control before and after planting conserve moisture needed for tree growth. Planting the trees 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 structure damaged caused by shrinking and swelling. Enlarging the absorption area helps to overcome the slow percolation rate in septic tank filter fields. Sewage lagoons can be located on the less sloping parts of the unit. Earthmoving for sanitary landfills is difficult during rainy periods because of the clay content.

Roads and streets should be graded to shed water, and the base material should be strengthened to support vehicular traffic. Control of roadside erosion helps to control erosion in the borrow and cut areas of graded roads and streets. Houdek soil in capability unit IIIe-2, Ethan soil in capability unit IVe-3; Silty range site.

HoA—Houdek-Prosper loams, 0 to 2 percent slopes. This map unit consists of deep, well drained and moderately well drained, nearly level soils on upland flats. Slopes are slightly convex to slightly concave and are broken by many shallow swales and poorly defined drainageways. Individual areas are irregular in shape and range from 10 to 200 acres in size. They are about 50 percent Houdek soils and 35 percent Prosper soils. The well drained Houdek soils are on slight rises. The moderately well drained Prosper soils are in slightly concave swales. Some areas of the Prosper soil are subject to flooding. The two soils are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Houdek soil has a surface layer of dark gray loam about 7 inches thick. The subsoil is about 22 inches of friable clay loam. It is dark grayish brown in the upper part, grayish brown in the next part, and light brownish gray in the lower part. The lower part is calcareous and has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. In places the subsoil is loam.

Typically, the Prosper soil has a surface layer of dark gray loam about 10 inches thick. The subsoil is about 24 inches of friable or firm clay loam. It is dark gray in the upper part, grayish brown in the next part, and light brownish gray in the lower part. The lower part is calcareous and has spots and streaks of soft lime. The underlying material to a depth of 60 inches is pale yellow, calcareous clay loam. In places the subsoil is loam.

Included with this unit in mapping are small areas of Davison, Dudley, Hoven, Stickney, and Tetonka soils. These soils make up about 15 percent of any one mapped area. The Davison, Dudley, and Stickney soils are in swales. The Davison soils are calcareous at or near the surface. The Dudley and Stickney soils have a claypan subsoil and contain more sodium than the Prosper soil. The poorly drained Hoven and Tetonka soils are in closed depressions.

The Houdek and Prosper soils are medium to high in fertility and moderate to high in content of organic matter. Available water capacity is high. Permeability is moderate in the subsoil of both soils and moderately slow in the underlying material. The shrink-swell potential is moderate. Runoff is slow, and water collects on the Prosper soil. The Prosper soil has a water table that is perched between depths of 3 and 6 feet early in the growing season in most years.

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

These soils are well suited to corn, small grain, and alfalfa. Temporary wetness on the Prosper soil delays spring planting in some years, but in most years the additional moisture is beneficial. Conserving moisture is the main concern if the soils are farmed. Crop residue management or stubble mulching and minimum tillage help to conserve moisture and control soil blowing. Field windbreaks and wind stripcropping (fig. 10) also help to control soil blowing. Returning crop residue to the soils and using grasses and legumes in the cropping system help to maintain fertility and tilth.

These soils are well suited to tame pasture and hayland. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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 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. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

Windbreaks and environmental plantings are well suited to these soils. All climatically suited trees and shrubs grow well. A year of fallow prior to planting and weed control before and after planting conserve moisture needed for tree growth.

The Houdek soil is better suited as a building site than the Prosper soil. Properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. Protection against flooding by runoff is especially important on the Prosper soil. Septic tank filter fields are best located on the Houdek soil. Enlarging the absorption area helps to overcome the slow percolation rate. These soils are well suited to sewage lagoons. Sanitary landfills are best located on the Houdek soil, but earthmoving is difficult during rainy periods because of the clay content in the subsoil and underlying material.

Roads and streets should be graded above potential flood levels on the Prosper soil, and the base material should be strengthened to support vehicular traffic. Capability unit IIc-2; Houdek soil in Silty range site, Prosper soil in Overflow range site.

HoB—Houdek-Prosper loams, 2 to 6 percent slopes. This map unit consists of deep, well drained and moderately well drained, undulating soils on uplands, typically on convex swells that rise above many narrow swales. Individual areas are irregular in shape and range from 15 to 300 acres in size. They are about 55 percent Houdek soils and 30 percent Prosper soils. The well drained Houdek soils are on the rises. The moderately well drained Prosper soils are in the slightly concave swales. In wet years some areas of the Prosper soil are subject to flooding. The two soils are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Houdek soil has a surface layer of dark gray loam about 7 inches thick. The subsoil is about 22 inches of friable clay loam. It is dark grayish brown in the upper part, grayish brown in the next part, and light brownish gray in the lower part. The lower part is calcareous and has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. In places the subsoil is loam.

Typically, the Prosper soil has a surface layer of dark gray loam about 10 inches thick. The subsoil is about 24 inches of friable or firm clay loam. It is dark gray in the upper part, grayish brown in the next part, and light brownish gray in the lower part. The lower part is calcareous and has spots and streaks of soft lime. The underlying material to a depth of 60 inches is pale yellow, calcareous clay loam. In places the subsoil is loam.

Included with this unit in mapping are small areas of Davison, Dudley, Hoven, Stickney, and Tetonka soils. These soils make up about 15 percent of some areas. The Davison, Dudley, and Stickney soils are on foot slopes and in swales. The Davison soils are calcareous at or near the surface. The Dudley and Stickney soils have a claypan subsoil and contain more sodium than the Prosper soil. The poorly drained Hoven and Tetonka soils are in closed depressions.

The Houdek and Prosper soils are medium to high in fertility and moderate to high in content of organic matter. Available water capacity is high. Permeability is moderate in the subsoil of both soils and moderately slow in the underlying material. The shrink-swell potential is moderate. Runoff is medium, and water collects on the Prosper soil. The Prosper soil has a water table that is perched between depths of 3 and 6 feet early in the growing season in most years.

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

These soils are well suited to corn, small grain, and alfalfa. Temporary wetness on the Prosper soil delays spring planting in some years, but in most years the additional moisture is beneficial. Controlling the moderate erosion and soil blowing hazards and conserving moisture are the major concerns if the soils are farmed. Slopes generally are too short and irregular for contour farming and terracing. Crop residue management or stubble mulching, minimum tillage, and grassed waterways help to control erosion and soil blowing and conserve moisture. Field windbreaks and wind stripcropping also help to control soil blowing. Returning crop residue to the soils and using grasses and legumes in the cropping system help to maintain fertility and tilth.

Seeding these soils to suited pasture plants is an effective means of controlling erosion. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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 tall, mid, and short grasses. Maintaining a good grass cover and ground mulch helps to prevent excessive soil losses and conserves moisture. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

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 and weed control before and after planting conserve moisture needed for tree growth.

The Houdek soil is better suited as a building site than the Prosper soil. Properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. Protection against flooding by runoff is especially important on the Prosper soil. Septic tank filter fields are best located on the Houdek soil. Enlarging the absorption area helps to overcome the slow percolation rate. Sewage lagoons can be located on the less sloping parts of the unit. Sanitary landfills can be located on the Houdek soil, but earthmoving is difficult during rainy periods because of the clay content in the subsoil and underlying material.

Roads and streets should be graded to shed water, and the base material should be strengthened to support vehicular traffic. Capability unit IIe-2; Silty range site.

Hv—Hoven silt loam. This deep, poorly drained, level soil is in closed depressions in the uplands. Areas are irregularly shaped and range from 5 to 40 acres in size. The surface is uneven in some areas where small mounds rise a few inches above intervening low spots. The soil commonly is flooded by runoff early in the growing season.

Typically, the surface layer is gray silt loam about 4 inches thick. The subsoil is gray, very firm or firm clay about 30 inches thick. The underlying material to a depth of 60 inches is light brownish gray and light gray, calcareous clay loam. On the edges of some areas, accumulations of salts are within a depth of 16 inches.

Included with this soil in mapping are small areas of Tetonka soils on the lowest parts of the depressions. These soils make up less than 10 percent of any one mapped area. They have a thicker surface layer and contain less sodium than the Hoven soil.

This soil is medium in fertility and moderate in content of organic matter. Available water capacity is moderate or high. Tilth is poor, and the soil is difficult to work when wet or dry. The claypan subsoil limits the growth of plant roots, water intake, and the amount of moisture released to plants. Permeability is very slow. The soil shrinks and swells markedly upon drying and wetting. Runoff is ponded, and water remains on the surface until it evaporates.

Most areas remain in native grass and are used for range, hay, and wildlife habitat. This soil has poor potential for crops, tame pasture and hayland, windbreaks and environmental plantings, recreation uses, and most engineering uses. The potential for wetland wildlife habitat is fair.

This soil is best suited to range. The natural plant cover is mainly western wheatgrass and sedges. In wet years the western wheatgrass is replaced by sedges and foxtail barley. Overgrazing while the site is wet encourages an increase of smartweed, curly dock, and other undesirable plants. A planned grazing system that includes proper grazing use and deferment of grazing when the site is wet maintains or improves the range condition. This soil is a potential site for dugouts that provide livestock water.

This soil is not suited to crops because of the intermittent wetness, the poor tilth, the sodium content, and the restrictive claypan subsoil near the surface. It can be used for tame pasture, but the choice of suitable pasture plants is limited and the stands are difficult to establish because of the poor tilth. Proper stocking rates, avoidance of grazing when the soil is wet, and weed control help to keep the pasture in good condition.

Windbreaks normally planted by machinery are not suited to this soil. Trees and shrubs that tolerate wetness and alkalinity can be grown for special purposes if they are planted by hand and given special care.

This soil has fair potential for wetland wildlife habitat. Shallow excavations that collect runoff and exclusion of livestock improve the potential.

Generally, locating buildings on other soils is more practical because this soil is wet and the shrink-swell potential is high. Sewage lagoons can be located on this soil, but other methods of waste disposal are best located on other soils. Roads and streets should be graded above flood levels, and the base material should be replaced to overcome the low strength for supporting vehicular traffic. Capability unit VIs-1; Closed Depression range site.

La—LaDelle silt loam. This deep, moderately well drained, nearly level soil is on low terraces and bottom lands. Individual areas are irregular in shape and range from 20 to 75 acres in size. Slopes are plane and are less than 2 percent. They are broken by meandering stream channels. Most areas are subject to brief flooding.

Typically, the surface soil is dark gray, very friable or friable silt loam about 16 inches thick. The lower 4 inches is calcareous. The underlying material to a depth of 29 inches is dark gray, friable, calcareous silt loam. Below this to a depth of 60 inches is grayish brown, calcareous silt loam.

Included with this soil in mapping are small areas of Egas and Lamo soils. These soils make up less than 15 percent of any one mapped area. They are in low areas. The poorly drained Egas soils contain more salts than the LaDelle soil. The Lamo soils are somewhat poorly drained.

This soil is high in fertility and in content of organic matter. Available water capacity is high. The water table fluctuates between depths of 4 and 6 feet early in the growing season. Permeability is moderate. The shrink-swell potential is moderate. Runoff is slow.

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

This soil is well suited to corn, small grain, and alfalfa. In wet years wetness from flooding and the water table delays spring planting, but in most years the additional moisture is beneficial. In dry years most crops are adversely affected by the lack of moisture. Conserving moisture is the main concern if the soil is cropped. Crop residue management or stubble mulching and minimum tillage conserve moisture and help to control soil blowing. Returning crop residue to the soil and using grasses and legumes in the cropping system help to maintain tilth and fertility.

This soil is well suited to tame pasture and hayland. All climatically suited pasture plants grow well. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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 tall and mid grasses. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

Trees and shrubs grown as windbreaks and environmental plantings are well suited to this soil. Proper site preparation and weed control before and after planting help to maintain the growth and vigor of the trees.

This soil is generally suitable for most recreation uses, but it should not be used for camp areas unless the site is adequately protected against flooding.

Buildings can be constructed if they are protected against flooding and the foundations and footings are designed to overcome the wetness from the water table and the shrinking and swelling of the soil. Sewage lagoons can be located on this soil if the site is protected against flooding and the floor of the lagoon is packed and sealed to reduce the risk of seepage. Other types of waste disposal generally are poorly suited because of the seasonal high water table.

Roads and streets should be graded above expected flood levels, and the base material should be strengthened to support vehicular traffic. Capability unit IIc-3; Overflow range site.

Lm—Lamo silt loam. This deep, somewhat poorly drained, nearly level soil is on bottom land (fig. 11). Individual areas are 300 feet to a half mile wide and as much as several miles long. They range from 20 to 325 acres. Slopes are plane and are less than 2 percent. They are broken by stream channels and meander scars. This soil is flooded for short periods in some years.

Typically, the surface soil is dark grayish brown, friable silt loam about 13 inches thick. The lower part is calcareous. Below the surface soil are transitional layers of gray, calcareous silt loam and silty clay loam about 13 inches thick. The underlying material to a depth of 60 inches is gray, calcareous silty clay loam. In places the depth to lime is more than 10 inches. A moderately well drained soil is on some of the higher parts of the landscape.

Included with this soil in mapping are small areas of Egas soils, which make up less than 10 percent of most areas. These poorly drained soils are in low areas. They contain more salts than the Lamo soil.

This soil is high in fertility and in content of organic matter. Available water capacity is high. The water table fluctuates between depths of 2 and 6 feet early in the growing season. Permeability is moderately slow. The soil shrinks and swells upon drying and wetting. Runoff is slow.

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

This soil is well suited to corn, small grain, and alfalfa if it is adequately drained. Wetness from flooding or the water table generally delays spring planting. In wet years late-planted crops are better suited than small grain. Wetness is the main concern if the soil is farmed. Artificial drainage is needed in areas where wetness seriously interferes with farming. Returning crop residue to the soil and using grasses and legumes in the cropping system help to 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, weed control, and applications of fertilizer 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 tall and mid grasses, but native trees and shrubs are adjacent to stream channels in most areas. If the range is overgrazed, the taller, more desirable grasses are replaced by less productive short grasses and weeds. A planned grazing system that includes proper grazing use and avoidance of grazing when the soil is wet maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

Windbreaks and environmental plantings are well suited to this soil. Suited trees and shrubs grow well because of the moisture provided by the water table. Proper site preparation and weed control before and after planting help to maintain the growth and vigor of the trees and shrubs.

Generally, this soil should not be used for camp areas because of the flood hazard. Some of the better drained areas are suitable as picnic areas and playgrounds, especially if they are protected against flooding.

Dwellings generally should not be built on this soil because of the flood hazard. Other buildings can be constructed if they are protected against flooding and the foundations and footings are designed to prevent structure damage caused by wetness and by shrinking and swelling of the soil. Sewage lagoons can be located on this soil if they are protected against flooding. Other methods of waste disposal generally are unsatisfactory because of the high water table.

Roads and streets should be graded above expected flood levels, and the base material should be strengthened to support vehicular traffic. Keeping moisture away from the subgrade reduces the damage caused by frost action. Capability unit IIw-2; Subirrigated range site.

LnA—Lane silt loam, 0 to 2 percent slopes. This deep, moderately well drained, nearly level soil is on upland flats, stream terraces, and alluvial fans. Individual areas are 500 feet to a half mile wide and as much as several miles long. They range from 30 to 180 acres. Slopes are plane to concave.

Typically, the surface layer is dark gray silt loam about 8 inches thick. The subsoil is about 30 inches of firm silty clay. It is dark gray in the upper part and grayish brown in the lower part. The lower part is calcareous and has spots of soft lime that extend into the underlying material. The underlying material to a depth of 44 inches is light brownish gray, calcareous silty clay. Below this to a depth of 60 inches is grayish brown, calcareous silty clay loam. On upland flats in the north-central part of the county, the depth to lime is greater than is typical for Lane soils. In places the subsoil is less clayey than is typical for Lane soils.

Included with this soil in mapping are small areas of Jerauld and Stickney soils. These soils make up less than 10 percent of most areas. The Jerauld soils are in low areas. They contain more sodium and other salts than the Lane soil. The Stickney soils are intermingled with the Lane soil. They have a claypan subsoil and contain more sodium than the Lane soil.

This soil is high in fertility and in content of organic matter. Available water capacity is moderate or high, but the clayey subsoil takes in water slowly and releases moisture slowly to plants. Permeability is moderately slow or slow. The subsoil shrinks and swells upon drying and wetting. Runoff is slow.

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

This soil is well suited to corn, small grain, and alfalfa. Improving water intake, conserving moisture, and controlling soil blowing are the major concerns if the soil is farmed. Crop residue management or stubble mulching and minimum tillage conserve moisture and help to control soil blowing. Field windbreaks and wind stripcropping also help to control soil blowing. Chiseling or subsoiling improves water intake. Returning crop residue to the soil and using grasses and legumes in the cropping system help to maintain fertility and tilth.

This soil is well suited to tame pasture and hayland. Planting the grasses and legumes best suited to the soil helps to control soil blowing and improves water intake. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to 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. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

Windbreaks and environmental plantings are well suited to this soil. All climatically suited trees and shrubs grow well. A year of fallow prior to planting and weed control before and after planting conserve moisture needed for growth and survival.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. Enlarging the absorption area in septic tank filter fields and laying the field in a bed of coarser material help to overcome the slow percolation rate. This soil is well suited to sewage lagoons. Earthmoving for sanitary landfills is difficult in rainy periods because of the clayey subsoil.

Roads and street should be graded to shed water, and the base material should be strengthened or replaced to support vehicular traffic. Capability unit IIs-1; Clayey range site.

Lo—Loup loamy fine sand. This deep, poorly drained, nearly level soil is in swales on uplands. Individual areas range from 5 to 20 acres in size. Slopes are plane to concave and are mostly less than 2 percent.

Typically, the surface soil is dark gray, very friable loamy fine sand about 16 inches thick. Below this is a transitional layer of grayish brown, very friable loamy fine sand about 4 inches thick. The underlying material to a depth of 60 inches is light brownish gray fine sand. In places the underlying material is loam or clay loam at a depth of 40 to 60 inches, and in places the soil is somewhat better drained than is typical for Loup soils.

Included with this soil in mapping are scattered small areas of Shue soils. These somewhat poorly drained soils are underlain by clay loam or loam at a depth of 20 to 40 inches. They make up less than 10 percent of any one mapped area.

This soil is low in fertility and moderately low in content of organic matter. Available water capacity is low, but the water table is within a depth of 3 feet during the greater part of the growing season. Permeability is rapid. The shrink-swell potential is low. Runoff is slow.

Many areas of this soil are farmed. The soil has good potential for range and fair potential for tame pasture and hayland and for wetland and rangeland wildlife habitat. It has poor potential for crops, windbreaks and environmental plantings, and most recreation and engineering uses.

This soil is poorly suited to crops. It commonly is farmed, however, because it occurs within larger areas of soils that are well suited to crops. In wet years crops grow poorly because of poor drainage. In other years, spring planting is delayed by wetness and late-planted crops are better suited than spring-sown crops. Controlling the wetness and the severe soil blowing hazard and improving fertility are the major concerns if the soil is cropped. If outlets are available, drainage can be improved. Crop residue management or stubble mulching, minimum tillage, wind stripcropping, and field windbreaks help to control soil blowing. Returning crop residue to the soil, using grasses and legumes in the cropping system, planting green manure crops, and applying animal manure improve fertility and tilth.

This soil is well suited to tame pasture and hayland. In some years, however, seeding is difficult because of wetness. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to keep the pasture in good condition.

This soil is well suited to range. The natural plant cover is mainly tall grasses. If the range is overgrazed, the tall grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and timely deferment of grazing promotes uniform grazing.

Windbreaks are moderately well suited to this soil. Trees and shrubs that can tolerate wetness grow well. New plantings survive poorly in dry years. Maintaining a mulch of crop residue on the surface helps to control soil blowing during site preparation.

Because of the high water table, locating buildings on other soils is more practical than applying the costly drainage measures that are required if this soil is used as a building site. Waste disposal systems also are not satisfactory because of the high water table. Roads and streets should be graded above potential levels of surface water. Capability unit IVw-2; Subirrigated range site.

Mo—Mobridge silt loam. This deep, moderately well drained, nearly level soil is in swales and on low terraces along drainageways in the uplands. Some areas are subject to flooding. Individual areas are irregular in shape and range from 60 to 100 acres or more in size. Slopes are plane to concave and are less than 2 percent.

Typically, the surface layer is dark gray silt loam about 6 inches thick. The subsurface layer is dark gray, friable silt loam about 8 inches thick. The subsoil is about 26 inches of friable silty clay loam. It is dark gray in the upper part and grayish brown in the lower part. The underlying material to a depth of 54 inches is light brownish gray, calcareous silty clay loam. Below this to a depth of 65 inches is grayish brown, calcareous silty clay loam. In places, the subsoil is silt loam and the soil is calcareous within a depth of 20 inches. A well drained soil that has a clay loam subsoil is on convex slopes on the edge of some areas.

Included with this soil in mapping are small areas of Lane soils. These soils make up less than 10 percent of any one mapped area. They have a more clayey subsoil than the Mobridge soil.

This soil is high in fertility and in content of organic matter. Available water capacity is high. Permeability is moderate. The shrink-swell potential is moderate. Runoff is slow.

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

This soil is well suited to corn, small grain, and alfalfa. Wetness caused by flooding delays spring planting in some years, but in most years the additional moisture is beneficial. In dry years crops commonly are adversely affected by the lack of moisture late in summer. Crop residue management or stubble mulching and minimum tillage conserve moisture and reduce the risk of soil blowing. Returning crop residue to the soil and using grasses and legumes in the cropping system help to 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, weed control, and applications of fertilizer help to 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. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

Windbreaks and environmental plantings are well suited to this soil. All climatically suited trees and shrubs grow well. Proper site preparation and weed control before and after planting conserve moisture and maintain the growth and vigor of the trees and shrubs.

Buildings can be constructed on this soil if the site is protected against flooding. Proper design of foundations and footings helps to prevent structure damage caused by shrinking and swelling of the soil. Septic tank filter fields are suited if the field is protected against flooding. Enlarging the absorption area helps to overcome the slow percolation rate in the soil. Packing and sealing the floor of sewage lagoons reduces the risk of seepage. This soil can be used for sanitary landfills if the site is protected against flooding. Excavating and backfilling, however, are difficult during wet periods because the subsoil is sticky when wet.

Roads and streets should be graded above expected flood levels, and the base material should be strengthened to support vehicular traffic. Capability unit IIc-3; Overflow range site.

OkB—Oko clay loam, 3 to 9 percent slopes. This deep, well drained, undulating to gently rolling soil is on uplands. Areas are irregularly shaped and range from 5 to 50 acres in size. Slopes are plane to convex.

Typically, the surface layer is very dark grayish brown clay loam about 5 inches thick. The subsoil is grayish brown, calcareous, firm clay about 18 inches thick. It has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light olive gray, olive gray, and light gray, calcareous clay. On some of the foot slopes, the surface layer is more than 5 inches thick. In places the subsoil contains slightly less clay than is typical for Oko soils.

Included with this soil in mapping are small areas of moderately well drained Lane soils on foot slopes and in swales. These soils make up less than 10 percent of any one mapped area. They contain less clay than the Oko soil.

This soil is medium in fertility and moderate in content of organic matter. If it is cropped, it loses its tilth easily and tends to crust after hard rains. Available water capacity is moderate or high, but the clayey subsoil takes in water slowly and releases moisture slowly to plants. Permeability is slow. The soil shrinks and swells markedly upon drying and wetting. Runoff is medium.

Most areas of this soil remain in native grass and are used for range. The 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. It has poor potential for most engineering uses.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Maintaining an adequate grass cover and ground mulch reduces the risk of erosion and increases 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. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

This soil is moderately well suited to small grain, corn, and alfalfa. Small grain is better suited than corn, especially where slopes exceed 6 percent. Controlling erosion and soil blowing, conserving moisture, improving water intake, and maintaining fertility and tilth are the major concerns if the soil is cropped. Crop residue management or stubble mulching, minimum tillage, and grassed waterways help to control erosion and soil blowing and conserve moisture. Contour farming and terracing can also help to control erosion and conserve moisture in areas where slopes are regular. Wind stripcropping helps to control soil blowing. Returning crop residue to the soil, using grasses and legumes in the cropping system, planting green manure crops, and applying animal manure help to maintain fertility and tilth. Chiseling or subsoiling improves water intake.

Seeding this soil to suited tame pasture plants is an effective means of controlling erosion and soil blowing. Bunch-type species should not be planted alone where slopes exceed 6 percent. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to keep the pasture in good condition after it is established.

This soil is moderately well suited to windbreaks and environmental plantings. Suited species of trees and shrubs grow well, but height is less than optimum for maximum protection by windbreaks. A year of fallow prior to planting and weed control before and after planting conserve moisture needed for tree growth. Planting the trees on the contour helps to control erosion.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. Enlarging the absorption area and laying the line in a bed of coarse material help to overcome the slow percolation rate in septic tank filter fields. Sewage lagoons can be located on the less sloping parts of the landscape. Area-type sanitary landfills work well on this soil, but the clayey texture severely limits the use of this soil for trench-type landfills.

Roads and streets should be graded to shed water, and the base material should be strengthened or replaced to support vehicular traffic. Control of roadside erosion helps to control erosion in borrow areas and cut areas. Capability unit IVe-4; Clayey range site.

OkD—Oko clay loam, 9 to 21 percent slopes. This deep, well drained, rolling to hilly soil is on the sides of ridges and entrenched drainageways in the uplands. Individual areas are irregular in shape and range from 50 to 125 acres in size. Slopes are convex and generally are short and irregular.

Typically, the surface layer is very dark grayish brown clay loam about 5 inches thick. The subsoil is grayish brown, calcareous, firm clay about 15 inches thick. It has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is light olive gray, olive gray, and light gray, calcareous clay. On some of the foot slopes, the surface layer is more than 5 inches thick. In places the subsoil contains less clay than is typical for Oko soils.

Included with this soil in mapping are small areas of moderately well drained Lane soils on foot slopes and in swales. These soils make up less than 10 percent of any one mapped area. They contain less clay than the Oko soil.

This soil is medium in fertility and moderate in content of organic matter. Available water capacity is moderate or high, but the clayey subsoil takes in water slowly and releases moisture slowly to plants. Permeability is slow. The soil shrinks and swells markedly upon drying and wetting. Runoff is medium to rapid.

Almost all areas of this soil remain in native grass and are used for range. The soil has good potential for range and rangeland wildlife habitat, fair potential for tame pasture and hayland, and fair to poor potential for most recreation uses. It has poor potential for crops and for most engineering uses.

This soil is best suited to range. The natural plant cover is mainly mid and short grasses. Maintaining an adequate grass cover and ground mulch reduces the risk of erosion and increases 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. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

This soil generally is not suited to cultivated crops because of the slope and a very severe erosion hazard. Seeding cultivated or disturbed areas to suited tame pasture plants is an effective means of reducing the risk of erosion and conserving moisture. Bunch-type species should not be planted alone because of the erosion hazard. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to keep the pasture in good condition after it is established.

This soil is not suited to windbreaks, but it can be used for environmental or special purpose plantings if the trees are planted by hand and given special care. Height is less than optimum unless additional moisture is provided.

If buildings are constructed on this soil, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. Revegetating disturbed areas around the building site as soon as possible helps to control erosion. Enlarging the absorption area and laying the filter lines in beds of coarser material help to overcome the slow percolation rate in septic tank filter fields. Sewage lagoons can be located on the less steep parts of the landscape.

Roads and streets that are graded to shed water can be built in the less steep areas of this soil. Strengthening or replacing the base material improves the ability of this soil to support vehicular traffic. Control of roadside erosion helps to control erosion in borrow areas and cut areas. Capability unit VIe-4; Clayey range site.

Pg—Pits, gravel. This map unit consists of open excavations, 5 to 30 feet deep, from which overburden sand and gravel have been removed. Individual areas are irregular in shape and range from 2 to 50 acres in size. Slopes are uneven and broken. They range from nearly level on the pit bottoms to almost vertical on the rims. Some of the pit bottoms are covered with water.

The pit bottoms typically are sand and gravel but are loam or clay loam glacial till or silty glacial drift where the sand and gravel has been completely removed. Mounds of overburden consisting of mixed loamy soil material are on the edges of the areas. The bottoms and sides of the pits support little or no vegetation. Annual weeds grow on the mounds of overburden material.

Most gravel pits can be used only as a source of sand and gravel for construction purposes. Some provide a limited amount of wildlife habitat. Abandoned gravel pits can be restored to range, tame pasture, or crops if reclamation measures are applied. These measures include shaping the areas and using the mounds of overburden material as a topsoil dressing. Applying fertilizer as needed helps to establish the range or pasture. Capability unit VIIIs-2; not assigned to a range site.

PrA—Prosper-Davison loams, 0 to 3 percent slopes. This map unit consists of deep, moderately well drained, nearly level to gently undulating soils on uplands, typically on very slight rises broken by many shallow swales and small depressions. Parts of the unit are subject to flooding in some years. Individual areas are irregular in shape and range from 10 to 60 acres in size. They are about 55 percent Prosper soils and 25 percent Davison soils. The Prosper soils are in the concave swales. The Davison soils are on the rises.

Typically, the Prosper soil has a surface layer of dark gray loam about 10 inches thick. The subsoil is about 24 inches of friable or firm clay loam. It is dark gray in the upper part, grayish brown in the next 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 60 inches is pale yellow, calcareous clay loam. In places the subsoil is loam.

Typically, the Davison soil has a surface layer of dark grayish brown, calcareous loam about 7 inches thick. The underlying material to a depth of about 23 inches is light gray, strongly calcareous, friable clay loam. Below this to a depth of 60 inches is light yellowish brown, light brownish gray, and light gray, calcareous clay loam.

Included with this unit in mapping are small areas of Dudley, Houdek, Hoven, Stickney, and Tetonka soils. These soils make up about 20 percent of any one mapped area. The Dudley and Stickney soils are on foot slopes and in swales. They have a claypan subsoil and contain more sodium than the Prosper soil. The well drained Houdek soils are on some of the rises. They contain less carbonates than the Davison soil. The poorly drained Hoven and Tetonka soils are in closed depressions.

The Prosper soil is high in fertility and in content of organic matter. The Davison soil is medium in fertility and moderate in content of organic matter. The high content of lime in the Davison soil affects the availability of plant nutrients. Available water capacity is high or moderate, and both soils have a water table that is perched within a depth of 6 feet during the early part of the growing season in most years. Permeability is moderate in the Davison soil and the upper part of the Prosper soil and moderately slow in the underlying material of the Prosper soil. The shrink-swell potential is moderate. Runoff is slow.

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

These soils are well suited to corn, small grain, and alfalfa. Wetness delays spring planting in some years, but in most years the additional moisture is beneficial. In dry years, crops generally are adversely affected by the lack of moisture late in summer. Because the content of lime is high, the Davison soil is highly susceptible to soil blowing. Maintaining fertility and tilth are other management concerns if the soils are cropped. Crop residue management or stubble mulching and minimum tillage conserve moisture and reduce the risk of soil blowing. Field windbreaks and wind stripcropping also help to control soil blowing. Returning crop residue to the soils and using grasses and legumes in the cropping system help to maintain fertility and tilth.

These soils are well suited to tame pasture and hayland. All climatically suited pasture plants grow well. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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 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. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

Windbreaks and environmental plantings are well suited to these soils. All climatically suited trees and shrubs grow well. Proper site preparation and weed control help to establish the plantings and maintain growth and vigor.

Buildings can be constructed on these soils if they are protected against flooding and if measures that improve drainage reduce the effects of the seasonal high water table. Proper design of foundations and footings helps to prevent structure damage caused by shrinking and swelling. Because of the potential flooding and the seasonal high water table, these soils are not suitable for septic tank filter fields, but they are suited to sewage lagoons if the lagoons are located on the surface and the bottom and sides are packed and sealed to reduce the risk of seepage.

Roads and streets should be graded above expected flood levels, and the base material should be strengthened to support vehicular traffic. Keeping moisture away from the subgrade reduces the likelihood of damage caused by frost action. Capability unit IIc-3; Prosper soil in Overflow range site, Davison soil in Silty range site.

Sh—Shue loamy fine sand. This deep, somewhat poorly drained, nearly level soil is in swales and shallow depressions in the uplands. In some years it is subject to flooding. Individual areas are irregular in shape and range from 10 to 80 acres in size. Slopes are plane to concave and are mostly less than 2 percent.

Typically, the surface layer is dark gray loamy fine sand about 10 inches thick. Below this is a transitional layer of grayish brown, very friable loamy fine sand about 6 inches thick. The underlying material to a depth of 26 inches is grayish brown, loose loamy fine sand. Below this to a depth of 60 inches is light gray and light brownish gray, calcareous clay loam. In places the underlying clay loam is 40 to 60 inches or more from the surface.

Included with this soil in mapping are small areas of Carthage, Forestburg, and Loup soils. These soils make up less than 15 percent of any one mapped area. The moderately well drained Carthage and Forestburg soils are on slight rises. Also, the Carthage soil contains more clay and less sand than the Shue soil. The poorly drained Loup soils are in low areas. They typically are underlain by fine sand that extends to a depth of 60 inches or more.

This soil is low in fertility and moderately low in content of organic matter. Available water capacity is moderate, and the water table is perched between depths of 1 foot and 3 feet during the early part of the growing season. Permeability is rapid in the upper part of the soil and moderately slow in the underlying clay loam. The shrink-swell potential is moderate in the underlying clay loam. Runoff is slow.

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

This soil is moderately well suited to corn, small grain, and alfalfa. A late-planted crop, such as corn, is better suited than spring-sown small grain because of wetness early in the growing season. In dry years crops are adversely affected by the lack of moisture late in summer. The hazard of soil blowing is severe. Maintaining tilth and fertility are concerns of management. Crop residue management or stubble mulching, minimum tillage, wind stripcropping, and field windbreaks help to control soil blowing and conserve moisture. Returning crop residue to the soil, using grasses and legumes in the cropping system, and planting green manure crops improve fertility and tilth.

Seeding this soil to tame pasture plants is an effective means of controlling soil blowing. All climatically suited pasture plants grow well because of the moisture supplied by the seasonal high water table. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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 tall grasses and sedges. Maintaining an adequate grass cover and ground mulch helps to control soil blowing and conserves moisture. If the range is overgrazed, the tall grasses lose vigor and are replaced by less productive grasses and undesirable weeds. Continuous overgrazing results in bare ground and soil blowing. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

This soil is well suited to windbreaks and environmental plantings. Trees and shrubs that can tolerate wetness from the seasonal high water table grow well. In dry years new plantings survive poorly. Maintaining a mulch of crop residue on the surface helps to control soil blowing during site preparation.

If buildings are constructed on this soil, protection against flooding and installation of subsurface drains help to prevent damage caused by wetness. Proper design of foundations and footings helps to prevent damage caused by shrinking and swelling of the underlying clay loam. Sewage lagoons can be located on the surface of this soil if they are protected against flooding and if the floor and sides are sealed to prevent seepage. Because of the water table, it is more practical to locate other types of waste disposal on better suited soils.

Roads and streets should be graded above expected flood levels. Keeping moisture away from the subgrade reduces the damage caused by frost action. Capability unit IVe-10; Subirrigated range site.

Sp—Spottswood loam. This deep, moderately well drained, nearly level soil is on terraces and uplands. Areas are irregularly shaped and range from 10 to 60 acres in size. Slopes are plane to concave and are mostly less than 2 percent.

Typically, the surface soil is dark gray loam about 12 inches thick. The subsoil is about 16 inches of friable clay loam. It is dark gray in the upper part, dark grayish brown in the next part, and grayish brown 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 60 inches is grayish brown, calcareous gravelly sand or sand and gravel.

Included with this soil in mapping are small areas of Delmont, Enet, and Grat soils. These soils make up less than 15 percent of any one mapped area. The somewhat excessively drained Delmont soils and well drained Enet soils are on slight rises. The poorly drained Grat soils are on the lower parts of the landscape. They contain more clay in the subsoil than the Spottswood soil.

This soil is medium in fertility and high in content of organic matter. Available water capacity is moderate, and the seasonal high water table fluctuates between depths of 3 and 6 feet during the early part of the growing season. Permeability is moderate in the subsoil and rapid in the underlying material. The shrink-swell potential is low. Runoff is slow.

Most areas of this soil are farmed. The soil has good potential for range, windbreaks and environmental plantings, openland wildlife habitat, and recreation uses.

It has fair potential for crops, tame pasture and hayland, and rangeland wildlife habitat. It has fair to poor potential for most engineering uses.

This soil is moderately well suited to corn, small grain, and alfalfa. In wet years, wetness delays spring planting and late-planted crops, such as corn and sorghum, are best suited. In dry years, the soil tends to be droughty and spring-sown small grain is better suited than corn. Controlling soil blowing and maintaining fertility are management concerns. Crop residue management or stubble mulching, minimum tillage, wind stripcropping, and field windbreaks conserve moisture and help to control soil blowing. Returning crop residue to the soil and using grasses and legumes in the cropping system help to maintain fertility and tilth.

This soil is moderately well suited to tame pasture and hayland. Production is limited in dry years because the soil tends to be droughty. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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 tall and mid grasses. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

Trees and shrubs grown as windbreaks and environmental plantings are well suited to this soil. Proper site preparation and weed control before and after planting help to establish and maintain the trees and shrubs.

If buildings with basements are constructed on this soil, subsurface drains help to prevent damage caused by wetness. Because of the water table, this soil is poorly suited to waste disposal systems. Sewage lagoons can be located on the surface of the soil if the floor and sides are sealed to prevent seepage into the water table.

Roads and streets should be graded to shed water, and the base material should be strengthened to support vehicular traffic. Keeping moisture away from the subgrade reduces the damage caused by frost action. Capability unit IIIs-2; Overflow range site.

St—Stickney-Jerauld silt loams. This map unit consists of deep, moderately well drained soils on upland flats along drainageways. Slopes are plane to slightly concave and are less than 2 percent. Individual areas are irregular in shape and range from 10 to 120 acres in size. They are about 60 percent Stickney soils and 25 percent Jerauld soils. The Stickney soils are on very slight rises. The Jerauld soils are in low areas. The two soils are so closely intermingled that it was not practical to separate them in mapping.

Typically, the Stickney soil has a surface layer of dark gray silt loam about 8 inches thick and a subsurface layer of gray silt loam about 3 inches thick. The next 2 inches is a transitional layer of dark gray silty clay loam that has tongues of gray silt loam. The subsoil is about 19 inches thick. It is gray, firm silty clay loam in the upper part; grayish brown silty clay loam in the next part; and light brownish gray, calcareous clay loam in the lower part. The lower part has spots and streaks of lime and gypsum that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray and light yellowish brown, calcareous clay loam. In some places the soil has no thin transitional layer and is shallower to sodium and other salts than is typical for Stickney soils. In others the soil has no subsurface layer and contains less sodium than is typical for Stickney soils.

Typically, the Jerauld soil has a surface layer of gray silt loam about 2 inches thick. The subsoil is dark gray, very firm or firm silty clay about 9 inches thick. The lower part is calcareous and has spots and streaks of salts that extend into the underlying material. The underlying material to a depth of 60 inches is grayish brown, light yellowish brown, and light brownish gray, calcareous clay loam.

Included with this unit in mapping are small areas of Davison, Hoven, and Tetonka soils. These soils make up about 15 percent of any one mapped area. The Davison soils are on very slight rises. They do not have a claypan subsoil, and they contain more lime and less sodium than the Stickney and Jerauld soils. The poorly drained Hoven and Tetonka soils are in closed depressions.

The Stickney and Jerauld soils are medium to low in fertility and are moderate in content of organic matter. The Stickney soil tends to crust after hard rains. Tilth is very poor in the Jerauld soil. The Jerauld soil commonly is strongly alkaline within a depth of 15 inches. Available water capacity is moderate or high, but both soils have a claypan subsoil that limits the growth of plant roots, water intake, and the amount of moisture released to plants. The claypan subsoil is especially limiting in the Jerauld soil. Permeability is slow or very slow. Both soils shrink and swell markedly upon drying and wetting. Runoff is slow.

Most areas are farmed. These soils have fair potential for crops and for tame pasture and hayland. The Stickney soil has good potential for range and rangeland wildlife habitat, fair to good potential for recreation uses, and fair potential for windbreaks and environmental plantings, but the Jerauld soil has poor potential for those uses. Both soils have poor potential for most engineering uses.

These soils are moderately well suited to farming. Small grain generally is better suited than corn. Crop growth commonly is uneven because growth is poor on the Jerauld soil. Spring planting is delayed in some years because the soils dry slowly. Improving water intake, tilth, and fertility and conserving moisture are the main concerns if the soils are cropped. Soil blowing is a problem in some areas. Crop residue management or stubble mulching, minimum tillage, and wind stripcropping conserve moisture and help to control soil blowing. Chiseling or subsoiling, timely tillage, grasses and legumes in the cropping system, green manure crops, and applications of animal manure improve water intake, tilth, and fertility.

These soils are also moderately well suited to tame pasture and hayland. Suited tame pasture plants grow well on the Stickney soil, but seeds are not successful on the Jerauld soil. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer 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. Maintaining an adequate grass cover and ground mulch conserves moisture and improves water intake. If the range is overgrazed, the taller, more desirable grasses lose vigor and are replaced by less productive short grasses. Continuous overgrazing results in considerable areas of bare Jerauld soil. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing. Range seeding helps to restore range that is in poor condition. It also helps to restore areas that have been farmed or otherwise disturbed.

Windbreaks and environmental plantings can be grown on the Stickney soil if optimum height is not expected or desired. A year of fallow prior to planting and weed control before and after planting conserve moisture needed for tree growth. The Jerauld soil is not suitable for windbreaks. It is suitable for special plantings if the trees and shrubs that can tolerate salts and strong alkalinity are selected.

If buildings are constructed on these soils, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structure damage caused by shrinking and swelling. The soils are well suited to sewage lagoons, but the clayey subsoil limits other methods of waste disposal. Enlarging the absorption area and laying the lines in beds of coarse material help to overcome the slow percolation rate in septic tank filter fields. Providing all-weather service roads facilitates the use of these soils for sanitary landfills.

Roads and streets should be graded to shed water, and the base material should be strengthened or replaced to support vehicular traffic. Stickney soil in capability unit IIIs-1, Clayey range site; Jerauld soil in capability unit VIs-1, Thin Claypan range site.

Ta—Tetonka loamy fine sand, overblown. This deep, poorly drained, level soil is in closed depressions that have an accumulation of windblown sandy material on the surface. Individual areas are irregular in shape and range from 5 to 15 acres in size. Slopes are less than 1 percent. The surface in some areas is uneven. Most areas are flooded by runoff during spring in most years.

Typically, the surface layer is gray loamy fine sand about 8 inches thick. The subsurface layer is gray, very friable silt loam about 11 inches thick. The subsoil is dark gray, firm clay about 25 inches thick. The underlying material is light brownish gray clay and clay loam.

This soil is medium in fertility and moderately low in content of organic matter. Reaction is medium acid to neutral in the subsoil. Available water capacity is moderate or high, and the water table is within a depth of 5 feet in most years. The sandy surface layer takes in water readily, but the subsoil is very slowly permeable. The shrink-swell potential is high in the subsoil. Runoff is ponded.

Most areas of this soil remain in native grass and are used for range. The soil has good potential for range, fair potential for wetland wildlife habitat, and poor potential for crops, tame pasture and hayland, windbreaks and environmental plantings, recreation uses, and most engineering uses. If artificial drainage is feasible or if drainage is adequate, the soil has fair potential for crops and good potential for tame pasture and hayland.

This soil is well suited to range. The natural plant cover is mainly tall and mid grasses and sedges. If the range is overgrazed, the taller, more desirable grasses are replaced by less productive short grasses and weeds. A planned grazing system that includes proper grazing use and avoidance of grazing when the soil is excessively wet maintains or improves the range condition. This soil is a favorable site for excavated dugouts that provide livestock water.

Some areas of this soil are farmed with larger areas of other soils. Because of wetness in spring, late-planted crops, such as corn, sorghum, and millet, are better suited than spring-sown small grain. In wet years, the soil is too wet for crops. Surface drains are beneficial, but artificial drainage is not feasible in most areas because suitable outlets are not available. The soil blowing hazard is severe if the soil is cropped. Crop residue management and minimum tillage help to maintain fertility and tilth.

Unless artificial drainage is provided, only water-tolerant tame pasture plants, such as creeping foxtail, reed canarygrass, and western wheatgrass, can be seeded. If drainage is improved, the soil can support a wider variety of pasture plants and produce a large amount of forage. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to keep the pasture in good condition after it is established.

Because of wetness, this soil is not suited to windbreaks normally planted by machinery. Water-tolerant trees and shrubs can be grown if they are planted by hand and given special care. Artificial drainage that lowers the water table improves the suitability of this soil for trees.

This soil is not suitable as a site for buildings because of the flooding and the high water table. Sewage lagoons can be located on this soil if the sandy surface layer is removed and the site is protected against flooding. Other types of waste disposal are not suitable.

Roads and streets should be graded above expected flood levels, and the base material should be replaced so that the roads and streets can support vehicular traffic. Capability unit IVw-1; Closed Depression range site.

Te—Tetonka-Hoven silt loams. This map unit consists of deep, poorly drained, level soils in closed depressions in the uplands. Slopes are less than 1 percent and are plane to slightly concave. The surface is uneven on the edge of some areas. Individual areas range from 5 to 30 acres in size and are about 60 to 80 percent Tetonka soils and 15 to 35 percent Hoven soils. The Tetonka soils generally are on the lower parts of the depressions. The Hoven soils are on the rims of the depressions. The two soils are so closely intermingled that it was not practical to separate them in mapping. Most areas are flooded by runoff during spring in most years.

Typically, the Tetonka soil has a surface layer of dark gray silt loam about 8 inches thick and a subsurface layer of gray, very friable silt loam about 6 inches thick. The next 4 inches is a transitional layer of dark gray clay loam that has tongues of gray silt loam. The subsoil is about 24 inches of firm clay and clay loam. It is gray in the upper part and grayish brown in the lower part. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. In places the surface layer and subsurface layer, combined, are less than 10 inches thick.

Typically, the Hoven soil has a surface layer of gray silt loam about 4 inches thick. The subsoil is gray, very firm or firm clay about 30 inches thick. The underlying material to a depth of 60 inches is light brownish gray and light gray, calcareous clay loam.

Included with this unit in mapping are small areas of Davison and Dudley soils on the rims of some of the depressions. These soils make up about 5 percent of any one mapped area. They are moderately well drained. The Davison soils do not have a firm subsoil and contain less sodium than the Hoven soil.

The Tetonka and Hoven soils are medium in fertility and moderate in content of organic matter. They tend to crust when dry. Tilth is very poor in the Hoven soil because the claypan subsoil is near the surface. Available water capacity is high or moderate, and the Tetonka soil has a water table that is usually within 5 feet of the surface. Permeability is very slow. The shrink-swell potential is high. Runoff is ponded.

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

These soils are well suited to range. The natural plant cover is mainly tall and mid grasses and sedges. If the range is overgrazed, the taller, more desirable grasses are replaced by less productive short grasses and weeds. Continuous overgrazing, especially when the soils are wet, results in bare ground during dry cycles and a cover of undesirable weeds during wet cycles. A planned grazing system that includes proper grazing use and avoidance of grazing when the soils are wet maintains or improves the range condition. This map unit is a favorable site for excavated dugouts that provide livestock water.

Some areas of these soils are farmed with larger areas of other soils. In wet years these soils are too wet for cultivation. In dry years crops grow poorly on the Hoven soil because tilth is very poor and the claypan subsoil limits water intake, the growth of plant roots, and the amount of moisture released to plants. Surface drains improve the suitability of the Tetonka soil for crops, but in most areas artificial drainage is not feasible because suitable outlets are not available. Crop residue management and timely tillage help to maintain tilth and fertility in areas that are cropped.

The Hoven soil is not suited to tame pasture plants. Unless drainage is improved, the Tetonka soil is suited only to water-tolerant species, such as creeping foxtail, reed canarygrass, and western wheatgrass. If drainage is improved, it is well suited to tame pasture and hayland. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to keep the pasture in good condition after it is established.

Because of wetness, these soils are not suited to windbreaks normally planted by machinery. Water-tolerant trees and shrubs can be grown if they are planted by hand and given special care.

Habitat for wetland wildlife can be enhanced on these soils by constructing level ditches or shallow pits that provide open water.

Because of flooding and the high water table, these soils are not suitable sites for buildings. Constructing the buildings on other soils generally is more practical than applying the costly drainage measures needed on these soils. Sewage lagoons generally function well, but other methods of waste disposal generally are not satisfactory because of flooding and the water table in the Tetonka soil.

Roads and streets should be graded above expected water levels, and the base material should be hauled in from other areas. Generally, locating roads and streets around this map unit is more practical than running them through the unit. Tetonka soil in capability unit IVw-1, Hoven soil in capability unit VIs-1; Closed Depression range site.

ZeC—Zell silt loam, 6 to 12 percent slopes. This deep, well drained, moderately sloping to strongly sloping soil is on upland ridges and along entrenched drainageways. Individual areas generally are long and narrow and range from 20 to 80 acres in size. Slopes are long and smooth and are convex.

Typically, the surface layer is dark gray silt loam about 6 inches thick. Below this is a transitional layer of grayish brown, very friable silt loam about 7 inches thick. The underlying material to a depth of 60 inches is light gray silt loam. The entire profile is calcareous.

Included with this soil in mapping are small areas of Great Bend soils on foot slopes. These soils make up less than 10 percent of any one mapped area. They are leached of lime to a depth of 11 inches or more.

This soil is low in fertility and moderately low in content of organic matter. Availability of plant nutrients is affected by the shallowness to a high content of lime. The soil is easy to work. Available water capacity is high, and permeability is moderate. The shrink-swell potential is low. Runoff is medium.

Most areas of this soil remain in native grass and are used as range. The soil has fair potential for range, tame pasture and hayland, rangeland wildlife habitat, and most recreation and engineering uses. It has poor potential for crops and for windbreaks and environmental plantings.

This soil is well suited to range. The natural plant cover is mainly mid and short grasses. Maintaining a good grass cover and ground mulch prevents excessive soil losses and increases the supply of moisture available to 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. A planned grazing system that includes proper grazing use and deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

This soil is poorly suited to farming because the erosion hazard is severe. Where slopes are less than 9 percent, it is suitable for close-sown crops if erosion and soil blowing are controlled. Contour farming, terracing, grassed waterways, and stubble mulching or crop residue management help to control erosion and soil blowing. Using grasses and legumes in the cropping system and planting green manure crops help to maintain fertility and tilth. In disturbed areas where slopes exceed 9 percent, erosion can be best controlled by seeding range plants or tame pasture plants.

Seeding disturbed areas of this soil to tame pasture plants is an effective means of controlling erosion and soil blowing. Bunch-type grasses should not be planted alone because of the severe erosion hazard. Maintaining a mulch of crop residue on the surface during seedbed preparation helps to control erosion. Proper stocking rates, rotation grazing, weed control, and applications of fertilizer help to keep the pasture in good condition.

This soil is suited to windbreaks only in areas where slopes are less than 9 percent. If windbreaks are grown, planting the trees and shrubs on the contour conserves moisture needed for tree growth. Other types of trees and shrubs can be planted if species that can tolerate a high content of lime are selected and if additional moisture is provided. No tree or shrub reaches its optimum height on this soil.

If buildings are constructed on this soil, proper design of foundations and footings helps to overcome the low strength of the soil for supporting loads. Disturbed areas around the building site should be revegetated as soon as possible to reduce the risk of erosion. Enlarging the absorption area helps to overcome the slow percolation rate in septic tank filter fields. Sewage lagoons can be located on the less sloping parts of the landscape. The floor and sides should be sealed to reduce the risk of seepage. This soil is well suited to sanitary landfills.

Roads and streets should be graded to shed water, and the base material should be strengthened to support vehicular traffic. Keeping moisture away from the subgrade helps to prevent damage caused by frost action. Control of roadside erosion helps to control erosion in borrow areas and cut areas. Capability unit VIe-3; Thin Upland 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 565,000 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 173,000 acres was used for close-grown crops, mainly spring wheat and oats; 145,000 acres for row crops, mainly corn harvested for grain or silage; 115,000 acres for rotation hay and pasture; 45,000 acres for permanent native or tame hayland; and 75,000 acres for permanent pasture. About 12,000 acres was in conservation use or summer fallow.

The potential of the soils in Beadle County for increased crop production is good. About 112,000 acres of potentially good cropland is used as rangeland, about 73,000 acres as pasture, and about 17,000 acres as permanent native hayland. In addition to this reserve productive capacity, 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 is the major problem on about 30 percent of the cropland and pasture in Beadle County. If the slope is more than 2 percent, erosion is a hazard on Beadle, Enet, Ethan, Hand, Houdek, and Oko soils.

Loss of the surface layer through erosion is damaging for two reasons. First, 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 Oko, on soils having a clayey subsoil, such as Beadle, and on sloping soils having a claypan subsoil, such as Dudley. Erosion also reduces productivity on soils that tend to be droughty, such as the Delmont, Enet, and Spottswood soils. Second, soil erosion on farmland 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 provides protective surface cover, reduces runoff, and increases infiltration. A cropping system that keeps a plant cover on the soil for extended periods can hold soil erosion losses to amounts that will not reduce the productive capacity of the soils. 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.

Slopes are so short and irregular that contour tillage or terracing is not practical in most areas of the sloping Beadle, Ethan, Hand, Houdek, and Oko soils. 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 infiltration and reduce runoff and the hazard of erosion. These practices can be adapted to most soils in the survey area.

Soils that have long, smooth slopes, such as Enet soils, are best suited to contouring and contour stripcropping. These soils are less suitable for terracing because the unfavorable subsoil would be exposed in terrace channels.

Soil blowing is a slight to severe hazard on almost all soils in the county. The soil blowing hazard is especially severe on the sandy Doger, Elsmere, Forestburg, Loup, and Shue soils and on Blendon and Carthage soils. The clayey Oko soils and soils that have a high content of lime, such as Davison and Zell soils, also are highly susceptible to soil blowing. 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, crop residue, or, through proper tillage, a rough surface minimizes soil blowing on these soils. Windbreaks of suited trees and shrubs also are effective in reducing the risk of soil blowing.

Information about the design of erosion-control systems for each kind of soil is contained in the Technical Guide, available in local offices of the Soil Conservation Service.

Soil drainage is the major management need on about 1 percent of the acreage used for crops and pasture in the survey area. The poorly drained Hoven, Loup, and Tetonka soils, which make up about 40,000 acres of the survey area, are naturally so wet that the production of crops commonly grown in the area is generally not possible. Artificial drainage generally is not feasible in most areas of these soils.

Wetness delays planting in some years on somewhat poorly and poorly drained soils, such as Grat and Shue soils. The moderately well drained to somewhat poorly drained Bon, Bonilla, Davis, LaDelle, Mobridge, and Prosper soils, which are on bottom land and in swales, receive additional moisture as floodwater from streams or as runoff from adjacent soils. During wet years tillage and planting are delayed in spring, but in most years drainage is adequate and the additional moisture benefits the crops. Artificial drainage rarely is needed on these soils.

Soil fertility is naturally low in the sandy Doger, Elsmere, Forestburg, and Shue soils, in soils that have a high content of lime, such as Zell soils, and in soils that are shallow over sand and gravel, such as Delmont and

Talmo soils. Grasses and legumes in the cropping system help to maintain fertility. On all soils, additions of fertilizer should be based on the results of soil tests, on the need of the crop, 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.

Beadle soils have a clayey subsoil, and Dudley soils have a claypan subsoil. Poor tilth is a problem on these soils. These soils dry out slowly in spring and are difficult to work. If they are wet when tilled, they tend to be very cloddy when dry and good seedbeds are difficult to prepare. Timely tillage, grasses and legumes in the cropping system, crop residue management, and chiseling improve tilth.

Field crops suited to the soils and climate of the survey area include close-growing crops and row crops. Spring wheat, oats, and alfalfa are the main close-growing crops. Winter wheat, barley, rye, and flax are also suitable but are grown to a lesser extent. Corn is the main row crop. A small acreage is used for sorghum. In dry years these row crops commonly are harvested for silage.

All commonly grown and climatically suited crops are suited to the deep, well drained and moderately well drained soils, such as Blendon, Bon, Bonilla, Carthage, Davison, Great Bend, Hand, Houdek, LaDelle, Lane, Mobridge, and Prosper soils.

Early maturing, more drought-resistant small grain is better suited than deeper rooted corn and alfalfa on soils with porous underlying material that limits the root depth and water storage capacity. Delmont, Enet, and Spottswood soils are examples.

Small grain and alfalfa are better suited than row crops on Beadle and Oko soils. These soils have a clayey subsoil that retards root growth and restricts the amount of water released to plants.

Soils that are rapidly permeable in the upper part, such as Elsmere, Forestburg and Shue soils, tend to be too droughty for shallow-rooted crops, such as small grain.

The pasture plants best suited to the climate and to most of the soils in the survey area are alfalfa, intermediate wheatgrass, and smooth bromegrass. Crested wheatgrass is well suited to soils that tend to be droughty, such as the Delmont, Enet, and Spottswood soils. A bunch-type species, such as crested wheatgrass, should not be planted alone if slopes are more than 6 percent because of the erosion hazard.

If the poorly drained Egas, Hoven, and Tetonka soils are used for pasture, the choice of pasture plants is limited to water-tolerant species, such as creeping foxtail and reed canarygrass.

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 rice, cranberries, 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 (*9*), all kinds of soil are grouped at three levels: capability class, subclass, and unit. 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 map 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-2 or IIIe-6.

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.

Rangeland

C. M. SCHUMACHER, range conservationist, Soil Conservation Service, helped prepare this section.

About 30 percent of the acreage of Beadle County is rangeland. The rangeland occurs generally as scattered small tracts throughout the county. The larger tracts are in the Beadle-Dudley map unit in the east-central part of the county and in the Betts-Ethan map unit in the southwestern part. Because of steep slopes or a claypan subsoil, the soils in these map units are less well suited to cultivation.

More than half of the farm income is derived from livestock, principally cattle. Cow-calf operations are predominant throughout the county. The average ranch is about 850 acres.

On many ranches the forage produced on rangeland is supplemented by crop stubble and tame pasture. In winter the native forage is often supplemented by protein concentrate or alfalfa. Creep feeding of calves and yearlings to increase market weight is practiced on some ranches.

The native vegetation in many parts of the survey area has been greatly depleted by continued excessive use. Many of the desirable tall grasses have been replaced by short grasses and weeds. As a result, the amount of forage produced may be less than half of that originally produced. Productivity of the rangeland can be increased by management that is effective for specific kinds of soil and range sites. Such management is based on soil survey information and rangeland inventories.

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.

Native woods and windbreaks

DAVID L. HINTZ, forester, Soil Conservation Service, helped prepare this section.

Beadle County has approximately 1,500 acres of native trees and shrubs. The soils that support trees are not classified as woodland. The trees and shrubs generally are on the flood plains along the James River and its principal tributaries.

Scattered individual plants or clumps of American elm, American plum, boxelder, common chokecherry, false indigo, green ash, peachleaf willow, plains cottonwood, sandbar willow, western snowberry, and some species of rose and hawthorne grow on the Lamo and LaDelle soils adjacent to the James River and on the Bon soils along the major creeks in the county. American elm, American plum, boxelder, bur oak, common chokecherry, green ash, plains cottonwood, peachleaf willow, western snowberry, and some species of rose are common in the swales that drain the Wessington Hills in the southwestern part of the county.

The early settlers valued the woody vegetation as a source of fuel and food. Presently, 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 to protect farmsteads and livestock. Such windbreaks are still needed. In recent years field windbreaks have been planted to help control soil blowing. Field 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, millet, and sunflowers.

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, sweet clover, 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 forbs, sedges, and woody plants.

Hardwood trees are planted trees and shrubs that provide food and cover for wildlife. 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 Russian-olive, American plum, common chokecherry, silver buffaloberry, and green ash.

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, saltgrass, and cordgrass and rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 8 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, and 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 bobwhite quail, pheasant, meadowlark, mourning dove, robin, fox squirrel, cottontail, jackrabbit, red fox, raccoon, and whitetail deer.

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, coot, herons, shore birds, red-winged blackbird, muskrat, mink, and beaver.

Rangeland habitat consists of areas of wild herbaceous plants and shrubs. Wildlife attracted to rangeland include coyote, whitetail deer, prairie chicken, sharp-tailed grouse, red fox, bobcat, prairie dog, magpie, horned lark, lark bunting, and jackrabbit.

Recreation

Lake Byron and areas along the James River are the principal recreation areas in the county. Lake Byron provides swimming, boating, fishing, and water skiing. Picnic areas, summer cottages, and year-round homes are on the shore. The James River provides fishing and, along the banks, several picnic areas. Playgrounds and other park facilities are along the James River in the city of Huron. Two public golf courses and one country club are in or near Huron.

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; and table 13, 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, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and 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, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have 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 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. Ranges 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 0.64. 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.

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 code for the Unified classification is that 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 (*7*). 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."

Beadle series

The Beadle series consists of deep, well drained, moderately slowly permeable soils formed in glacial till. These soils are on uplands. Slopes range from 0 to 9 percent.

Beadle soils are near Houdek, Lane, and Prosper soils. Houdek soils have less clay in the B2t horizon than Beadle soils. Lane and Prosper soils are moderately well drained and have a mollic epipedon that is more than 20 inches thick.

Typical pedon of Beadle loam, 0 to 2 percent slopes (fig. 12), 1,100 feet west and 180 feet north of the southeast corner of sec. 18, T. 113 N., R. 61 W.

A1—0 to 7 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak medium granular; slightly hard, friable, slightly sticky and slightly plastic; neutral; gradual smooth boundary.

B21t—7 to 14 inches; dark grayish brown (10YR 4/2) clay loam, faces of peds very dark brown (10YR 2/2) moist, dark brown (10YR 3/3) rubbed and moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; neutral; gradual smooth boundary.

B22t—14 to 17 inches; dark grayish brown (10YR 4/2) clay, faces of peds very dark grayish brown (10YR 3/2) moist, dark brown (10YR 3/3) rubbed and moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; neutral; gradual wavy boundary.

B3ca—17 to 30 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; many fine segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

C1ca—30 to 36 inches; light brownish gray (2.4Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, sticky and plastic; few fine segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

C2—36 to 60 inches; light brownish gray (2.5Y 6/2) and grayish brown (2.5Y 5/2) clay loam, grayish brown (2.5Y 5/2) and dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 16 to 45 inches. The mollic epipedon is 8 to 20 inches thick and includes all or part of the B2t horizon. The depth to free carbonates ranges from 12 to 25 inches.

The A horizon has color value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It typically is loam but is silt loam in some pedons. It is slightly acid or neutral and is 6 to 11 inches thick. The B2t horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 to 4 moist), and chroma of 2 or 3. It is clay loam or clay averaging between 35 and 45 percent clay and is neutral or mildly alkaline. The B3ca and C1ca horizons have hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 or 3. The B3ca and C horizons are mildly alkaline or moderately alkaline. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. Iron oxide stains inherent in the parent material, shale fragments, and nests of gypsum are in some pedons.

Betts series

The Betts series consists of deep, excessively drained soils that are moderately permeable in the upper part and moderately slowly permeable in the lower part. These soils formed in glacial till. They are on uplands. Slopes range from 6 to 40 percent.

Betts soils are near Ethan, Hand, and Houdek soils and are similar to Zell soils. Ethan, Hand, and Houdek soils have a mollic epipedon and are deeper to free carbonates than Betts soils. Zell soils are coarse-silty.

Typical pedon of Betts loam, in an area of Betts-Ethan loams, 9 to 21 percent slopes, 250 feet south and 100 feet east of the northwest corner of sec. 19, T. 109 N., R. 65 W.

A1—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, friable, slightly sticky; slight effervescence; moderately alkaline; clear wavy boundary.

B2—5 to 9 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky; strong effervescence; moderately alkaline; clear wavy boundary.

C1ca—9 to 17 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky; common fine and medium segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C2ca—17 to 27 inches; light brownish gray (2.5Y 6/2) clay loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky; few fine dark stains (oxides); common fine and medium segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C3—27 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine dark stains (oxides); few medium segregations of lime; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 4 to 10 inches. Free carbonates are at the surface or within 3 inches of the surface. Coarse fragments ranging from pebbles to stones commonly are throughout the soil.

The A1 horizon has color value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is 2 to 5 inches thick. In cultivated areas the Ap horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. The A horizon is neutral to moderately alkaline. The B2 horizon has hue of 10YR or 2.5Y, value of 5 to 6 (4 or 5 moist), and chroma of 2 or 3. It is mildly alkaline or moderately alkaline. In cultivated areas some pedons lack a B horizon and have an AC horizon. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. It is clay loam or loam and is mildly alkaline or moderately alkaline.

Blendon series

The Blendon series consists of deep, well drained, moderately rapidly permeable soils formed in sandy glacial melt water deposits. These soils are on terraces and alluvial fans. Slopes range from 0 to 6 percent.

Blendon soils are near Carthage, Doger, and Forestburg soils. Carthage and Forestburg soils have a contrasting loamy IIC horizon at a depth of 20 to 40 inches. Doger soils are sandy and have a mollic epipedon that is less than 20 inches thick.

Typical pedon of Blendon fine sandy loam, 0 to 2 percent slopes, 1,510 feet south and 38 feet west of the northeast corner of sec. 6, T. 109 N., R. 61 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) fine sandy loam, black (10YR 2/1) moist; weak fine and medium granular structure; slightly hard, friable; common fine roots; slightly acid; clear smooth boundary.

B2—10 to 24 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; moderate medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable; common fine roots; slightly acid; gradual wavy boundary.

B3—24 to 32 inches; dark grayish brown (10YR 4/2) light fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; common fine roots; slightly acid; gradual wavy boundary.

C1—32 to 55 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 3/3) moist; massive; loose; neutral; gradual wavy boundary.

C2—55 to 60 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 3/3) moist; single grained; loose; neutral.

The thickness of the solum ranges from 24 to 40 inches, and the depth to free carbonates ranges from 40 to 60 inches or more. The mollic epipedon is 20 to 40 inches or more thick.

The A horizon has color value of 3 or 4 (2 moist) and chroma of 1 or 2. It typically is fine sandy loam but is loam in some pedons. It is slightly acid or neutral and is 10 to 16 inches thick. The B2 horizon has color value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is sandy loam in some pedons and is neutral or slightly acid. Some pedons lack a B3 horizon. The C 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 neutral or moderately alkaline. Loam or clay loam is between depths of 40 and 60 inches in some pedons.

Bon series

The Bon series consists of deep, moderately well drained, moderately permeable soils formed in calcareous, stratified alluvium. These soils are on low terraces and bottom land. Slopes are less than 2 percent.

Bon soils are similar to the Bonilla, Davis, LaDelle, and Lamo soils. Bonilla soils regularly decrease in organic-matter content with increasing depth. Davis soils are deeper to free carbonates than Bon soils. LaDelle and Lamo soils are fine-silty.

Typical pedon of Bon silt loam, channeled, 425 feet south and 115 feet west of the northeast corner of sec. 12, T. 110 N., R. 59 W.

A11—0 to 8 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; neutral; clear smooth boundary.

A12—8 to 13 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky; slight effervescence; mildly alkaline; clear wavy boundary.

A13—13 to 19 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky; few fine striations of segregated lime; slight effervescence; mildly alkaline; clear wavy boundary.

A14—19 to 31 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky; common fine segregations of lime; strong effervescence; moderately alkaline; clear wavy boundary.

C1—31 to 36 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many medium and fine segregations of lime; strong effervescence; moderately alkaline; gradual smooth boundary.

C2—36 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine segregations of lime; slight effervescence; moderately alkaline.

The solum and the mollic epipedon range from 20 to 40 inches in thickness. Free carbonates are at the surface or within 16 inches of the surface.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. It is silt loam, loam, or very fine sandy loam and is neutral to moderately alkaline. The C horizon has hue of 10YR, 2.5Y, or 5Y; value of 5 or 6 (4 or 5 moist); and chroma of 2 or 3. It is stratified with coarser material in some pedons.

Bonilla series

The Bonilla series consists of deep, moderately well drained soils in upland swales and on flats and foot slopes. These soils formed in stratified loamy glacial drift. Permeability is moderate in the solum and moderate or moderately slow in the underlying material. Slopes range from 0 to 6 percent.

Bonilla soils are similar to Davis and Prosper soils and are near Davison and Hand soils. Davis soils formed in alluvium and typically are deeper to free carbonates than Bonilla soils. Davison soils have calcic horizons. Hand soils have a mollic epipedon that is less than 20 inches thick. Prosper soils have argillic horizons.

Typical pedon of Bonilla loam, in an area of Hand-Bonilla loams, 0 to 3 percent slopes, 1,180 feet west and 210 feet north of the southeast corner of sec. 2, T. 112 N., R. 63 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky; neutral; abrupt smooth boundary.

A12—7 to 9 inches; dark grayish brown (10YR 4/2) loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky; neutral; gradual smooth boundary.

B2—9 to 18 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky; neutral; gradual wavy boundary.

B22—18 to 23 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky; neutral; gradual wavy boundary.

B3ca—23 to 29 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, friable, slightly sticky; common fine segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

C1ca—29 to 38 inches; light gray (2.5Y 7/2) clay loam, light olive brown (2.5Y 5/4) moist; few fine faint mottles of dark yellowish brown (10YR 4/6); massive; hard, friable, slightly sticky and slightly plastic; common fine and medium segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

C2—38 to 60 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; few fine faint mottles of light olive brown (2.5Y 5/6); massive; hard, friable, slightly sticky and slightly plastic; few fine segregations of lime; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 20 to 47 inches. The thickness of the mollic epipedon and the depth to free carbonates range from 20 to 34 inches.

The A horizon has color value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is fine sandy loam in some pedons. It is slightly acid or neutral and is 6 to 10 inches thick. The B2 horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 to 4 moist), and chroma of 1 or 2. It is clay loam in some pedons. It is neutral or mildly alkaline. The B3ca and C horizons have hue of 2.5Y or 5Y, value of 6 or 7 (4 or 5 moist), and chroma of 1 to 4. They are loam, clay loam, or silty clay loam and in some pedons are stratified with thin layers of coarser or finer material. The B3ca and C horizons are mildly alkaline or moderately alkaline. The C horizon has nests of gypsum and iron stains in some pedons.

Carthage series

The Carthage series consists of deep, moderately well drained soils formed in outwash sediments underlain by glacial till or glacial drift within a depth of 40 inches. These soils are on uplands. Permeability is moderately rapid in the upper part and moderately slow in the lower part. Slopes range from 0 to 6 percent.

Carthage soils are near Blendon, Doger, and Shue soils and are similar to Forestburg soils. Blendon and Doger soils do not have a contrasting IIC horizon within a depth of 40 inches. Forestburg soils are sandy. Shue soils are somewhat poorly drained.

Typical pedon of Carthage fine sandy loam, 0 to 2 percent slopes, 405 feet south and 55 feet east of the northwest corner of sec. 20, T. 111 N., R. 60 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) fine sandy loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable; neutral; gradual wavy boundary.

A12—8 to 20 inches; very dark gray (10YR 3/1) fine sandy loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, very friable; neutral; gradual wavy boundary.

B2—20 to 27 inches; dark gray (10YR 4/1) fine sandy loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; neutral; gradual wavy boundary.

C1—27 to 32 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; few fine faint mottles, dark brown (10YR 3/3) and dark yellowish brown (10YR 3/4) moist; single grained; loose; neutral; abrupt wavy boundary.

IIC2ca—32 to 40 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine and medium distinct mottles, yellowish brown (10YR 5/4 and 5/6) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine dark concretions (oxides); common fine segregations of lime; strong effervescence; moderately alkaline; gradual smooth boundary.

IIC3—40 to 60 inches; light brownish gray (2.5Y 6/2) and light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) moist; few fine and medium distinct mottles, yellowish brown (10YR 5/4 and 5/6) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine dark concretions (oxides); few fine segregations of lime; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 34 inches. The thickness of the mollic epipedon and the depth to free carbonates range from 20 to 40 inches.

The A horizon has color value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is loam in some pedons and is slightly acid or neutral. It is 15 to 23 inches thick. The B2 horizon has color value of 3 to 5 (3 or 4 moist) and chroma of 1 to 4. It is sandy loam in some pedons and is slightly acid or neutral. The C 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 sandy loam in some pedons and is neutral to moderately alkaline. Some pedons lack a C horizon. The IIC horizon has color value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is mildly alkaline or moderately alkaline.

Davis series

The Davis series consists of deep, moderately well drained, moderately permeable soils formed in loamy alluvium. These soils are on foot slopes, alluvial fans, and high bottom land. Slopes range from 2 to 9 percent.

Davis soils are similar to Bon, Bonilla, LaDelle, and Lamo soils. Bon, LaDelle, and Lamo soils are shallower to free carbonates than Davis soils. In addition, LaDelle and Lamo soils are fine-silty. Bonilla soils formed in glacial drift and typically are shallower to free carbonates than Davis soils.

Typical pedon of Davis loam, 2 to 9 percent slopes, 528 feet east and 150 feet north of the southwest corner of sec. 9, T. 109 N., R. 64 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky; neutral; abrupt smooth boundary.

B1—7 to 13 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky; neutral; clear smooth boundary.

B21—13 to 20 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, friable, slightly sticky; neutral; clear smooth boundary.

B22—20 to 30 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky; neutral; clear smooth boundary.

B3—30 to 39 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky; slight effervescence; mildly alkaline; gradual wavy boundary.

C—39 to 60 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, slightly sticky; few fine segregations of lime; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 30 to 64 inches. The depth to carbonates and the thickness of the mollic epipedon range from 20 to more than 50 inches.

The A horizon has color value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is neutral or slightly acid and is 7 to 18 inches thick. The B horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 to 4 moist), and chroma of 1 or 2. It is slightly acid or neutral. The C horizon has colors similar to those of the B horizon. It is loam in some pedons and commonly is stratified with layers of sandy loam, silt loam, or silty clay loam. It is mildly alkaline or moderately alkaline.

Davison series

The Davison series consists of deep, moderately well drained, moderately permeable soils formed in stratified loamy glacial drift. These soils have calcic horizons. They are in swales and drainageways on uplands. Slopes range from 0 to 3 percent.

Davison soils are near Bonilla, Dudley, and Prosper soils. Bonilla, Dudley, and Prosper soils lack calcic horizons. In addition, Dudley soils have natric horizons and Prosper soils have argillic horizons.

Typical pedon of Davison loam, in an area of Prosper-Davison loams, 0 to 3 percent slopes, 830 feet south and 312 feet east of the northwest corner of sec. 11, T. 112 N., R. 64 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium granular structure; slightly hard, friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

C1ca—7 to 16 inches; light gray (2.5Y 7/2) clay loam, light olive brown (2.5Y 5/4) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky; few fine segregations of lime; violent effervescence; moderately alkaline; abrupt smooth boundary.

C2ca—16 to 23 inches; light gray (2.5Y 7/2) clay loam, light olive brown (2.5Y 5/4) moist; few fine distinct mottles of strong brown (7.5YR 5/8); weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky; common fine segregations of lime; violent effervescence; moderately alkaline; gradual smooth boundary.

C3—23 to 34 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; common fine distinct mottles of strong brown (7.5YR 5/8); massive; hard, friable, slightly sticky and slightly plastic; few fine nests of gypsum; strong effervescence; mildly alkaline; gradual smooth boundary.

C4cs—34 to 44 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; common fine distinct mottles of strong brown (7.5YR 5/8); massive; hard, friable, slightly sticky and slightly plastic; common medium nests of gypsum; strong effervescence; mildly alkaline; gradual smooth boundary.

C5—44 to 60 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; common fine distinct mottles of strong brown (7.5YR 5/8); massive; hard, friable, slightly sticky and slightly plastic; few fine nests of gypsum; strong effervescence; mildly alkaline; gradual smooth boundary.

The mollic epipedon is 7 to 15 inches thick. Free carbonates typically are at the surface, but some pedons are leached to a depth of as much as 6 inches. The calcium carbonate equivalent ranges from 15 to 30 percent within a depth of 15 inches.

The A horizon has color value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is fine sandy loam in some pedons and is neutral to moderately alkaline. Some pedons have an AC horizon. The Cca horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is moderately alkaline or strongly alkaline. In some pedons the C horizon is stratified with layers of coarser material. Reaction below the Cca horizon is mildly alkaline or moderately alkaline.

Delmont series

The Delmont series consists of somewhat excessively drained soils on upland terraces. These soils formed in loamy material that is shallow over gravelly sand or sand and gravel. Permeability is moderate or moderately rapid in the solum and rapid in the sand and gravel. Slopes range from 0 to 6 percent.

Delmont soils are near Enet, Grat, Spottswood, and Talmo soils. Enet, Grat, and Spottswood soils are moderately deep over sand and gravel. In addition, Spottswood soils are moderately well drained and Grat soils are poorly drained. Talmo soils lack a B horizon and have sand and gravel within a depth of 10 inches.

Typical pedon of Delmont loam, 0 to 2 percent slopes (fig. 13), 520 feet west and 140 feet north of the southeast corner of sec. 32, T. 112 N., R. 62 W.

A1—0 to 7 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak medium granular; soft, friable; neutral; gradual smooth boundary.

B2—7 to 16 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable; neutral; abrupt smooth boundary.

IIC1ca—16 to 34 inches; grayish brown (2.5Y 5/2) gravelly sand, dark grayish brown (2.5Y 4/2) moist; single grained; loose; pebbles coated with calcium carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

IIC2—34 to 60 inches; light gray (2.5Y 7/2) sand stratified with gravel, grayish brown (2.5Y 5/2) moist, single grained; loose; slight effervescence; mildly alkaline.

The solum and the mollic epipedon are 10 to 20 inches thick. The depth to free carbonates and the depth to the underlying sand and gravel are 10 to 20 inches.

The A horizon has color value of 3 or 4 (2 or 3 moist) and chroma of 1 to 3. It is fine sandy loam in some pedons. It is neutral or mildly alkaline and is 4 to 7 inches thick. The B2 horizon has color value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is neutral or mildly alkaline. Some pedons have a B3 horizon of fine sandy loam. The IIC 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 mildly alkaline or moderately alkaline.

Doger series

The Doger series consists of well drained, rapidly permeable soils formed in wind-worked sandy material. These soils are on uplands. Slopes range from 0 to 6 percent.

Doger soils are near Blendon, Carthage, and Forestburg soils. Blendon soils have a mollic epipedon that is more than 20 inches thick and are coarse-loamy. Carthage and Forestburg soils have a contrasting IIC horizon within a depth of 40 inches.

Typical pedon of Doger loamy fine sand 1,600 feet west and 100 feet south of the northeast corner of sec. 25, T. 109 N., R. 61 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) loamy fine sand, black (10YR 2/1) moist; weak medium and fine granular structure; soft, very friable; neutral; abrupt smooth boundary.

A12—6 to 11 inches; very dark gray (10YR 3/1) loamy fine sand, black (10YR 2/1) moist; weak medium and fine subangular blocky structure parting to weak medium and fine granular; soft, very friable; neutral; gradual wavy boundary.

AC1—11 to 17 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium and fine subangular blocky; soft, loose; neutral; gradual wavy boundary.

AC2—17 to 24 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium and coarse prismatic structure parting to weak medium and fine subangular blocky; soft, loose; neutral; gradual wavy boundary.

C1—24 to 28 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose; mildly alkaline; gradual wavy boundary.

C2—28 to 42 inches; light brownish gray (2.5Y 6/2) fine sand, grayish brown (2.5Y 5/2) moist; single grained; loose; mildly alkaline; gradual wavy boundary.

C3—42 to 60 inches; light gray (2.5Y 7/2) fine sand, dark grayish brown (2.5Y 4/2) moist; single grained; loose; mildly alkaline; gradual wavy boundary.

The thickness of the solum ranges from 20 to 50 inches. The mollic epipedon is 10 to 20 inches thick. Mollic colors extend below 20 inches, but the organic-carbon content is less than 0.60 percent. The soils are slightly acid to mildly alkaline throughout the profile.

The A and AC horizons have color value of 3 to 5 (2 or 3 moist) and chroma of 1 to 3. The A horizon is loamy sand in some pedons. The C horizon has color value of 5 to 7 (4 to 6 moist) and chroma of 2 or 3. The C horizon is loam or clay loam below a depth of 40 inches in some pedons.

Dudley series

The Dudley series consists of deep, moderately well drained and somewhat poorly drained, slowly or very slowly permeable soils formed in glacial till. These soils are on uplands. They have natric horizons. Slopes range from 0 to 6 percent.

Dudley soils are near Davison, Jerauld, and Stickney soils. Davison soils lack natric horizons. Jerauld soils have visible salts within 16 inches of the surface. Stickney soils lack columnar structure.

Typical pedon of Dudley silt loam, in an area of Dudley-Stickney silt loams, 0 to 3 percent slopes, 550 feet west and 130 feet south of the northeast corner of sec. 24, T. 112 N., R. 59 W.

A1—0 to 7 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

A2—7 to 9 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak medium platy structure parting to weak fine granular; soft, friable; neutral; abrupt smooth boundary.

B21t—9 to 14 inches; dark grayish brown (10YR 4/2) clay, black (10YR 2/1) moist; gray (10YR 6/1) thin coats on top of columns; moderate medium columnar structure parting to moderate medium and fine blocky; very hard, very firm, sticky and plastic; neutral; gradual wavy boundary.

B22t—14 to 22 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine blocky; very hard, very firm, sticky and plastic; mildly alkaline; gradual wavy boundary.

B3cs—22 to 27 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and slightly plastic; common fine and medium nests of gypsum; few fine segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

C1cacs—27 to 31 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine and medium nests of gypsum; common medium segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C2cs—31 to 47 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common medium nests of gypsum; strong effervescence; moderately alkaline; gradual wavy boundary.

C3—47 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; few fine distinct mottles of yellowish brown (10YR 5/6); massive; hard, friable, slightly sticky and slightly plastic; moderately alkaline; strong effervescence.

The thickness of the solum ranges from 19 to 43 inches. The depth to carbonates and to crystals of gypsum ranges from 16 to 35 inches. The mollic epipedon is 20 to 30 inches thick.

The A1 horizon has color value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is 4 to 8 inches thick. The A2 horizon has color value of 5 to 7 (3 to 5 moist) and chroma of 1 or 2. It is 1 inch to 3 inches thick. The A1 and A2 horizons are loam in some pedons and are medium acid to neutral. The B2t horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. It is clay or clay loam averaging between 35 and 50 percent clay and more than 15 percent fine sand or coarser. It is neutral to moderately alkaline. The B3 horizon has color value of 4 to 6 (3 or 4 moist) and chroma of 2 or 3. The B3 and C horizons are mildly alkaline to strongly alkaline.

Durrstein series

The Durrstein series consists of deep, poorly drained, slowly or very slowly permeable soils formed in alluvium. These soils are on bottom land. They have natric horizons. Slopes are less than 1 percent.

Durrstein soils are similar to Egas, Grat, Hoven, and Jerauld soils. Egas and Grat soils lack natric horizons. In addition, Grat soils have a IIC horizon of sand and gravel. Hoven soils lack visible accumulations of salts within a depth of 15 inches and generally have a thicker solum than Durrstein soils. Jerauld soils are moderately well drained.

Typical pedon of Durrstein silt loam 700 feet west and 125 feet north of the southeast corner of sec. 1, T. 110 N., R. 60 W.

A2—0 to 4 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak thin platy structure parting to weak fine granular; soft, friable; many roots; neutral; abrupt smooth boundary.

B21t—4 to 10 inches; dark gray (10YR 4/1) clay, black (10YR 2/1) moist; gray (10YR 6/1) thin coats on tops of columnar peds; moderate medium columnar structure parting to strong fine and medium blocky; very hard, very firm, sticky and plastic; common roots; moderately alkaline; gradual smooth boundary.

B22t—10 to 15 inches; dark gray (10YR 4/1) clay, black (10YR 2/1) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; very hard, very firm, sticky and plastic; few fine striations of salts; few fine segregations of lime; slight effervescence; few roots; moderately alkaline; gradual wavy boundary.

B3ca—15 to 20 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few fine striations and nests of salts; few fine segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C1casa—20 to 25 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; common medium distinct mottles of dark yellowish brown (10YR 4/6); weak medium subangular blocky structure; hard, friable, sticky and slightly plastic; common fine nests of salts; strong effervescence; moderately alkaline; gradual wavy boundary.

C2sa—25 to 41 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common medium distinct mottles of dark yellowish brown (10YR 4/6); massive; hard, friable, slightly sticky and slightly plastic; common fine nests of salts; slight effervescence; moderately alkaline; gradual wavy boundary.

C3—41 to 60 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; common medium distinct mottles of dark yellowish brown (10YR 4/6); massive; hard, friable, slightly sticky and slightly plastic; few fine nests of salts; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 10 to 30 inches. The depth to segregations of salts ranges from 5 to 15 inches.

Some pedons have an A1 horizon. This horizon is less than 2 inches thick. The A2 horizon has color value of 5 or 6 (3 or 4 moist) and chroma of 1 or 2. It is loam in some pedons. It is neutral or slightly acid and is 1 inch to 4 inches thick. The B2t horizon has hue or 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is clay, clay loam, or silty clay averaging between 35 and 60 percent clay and more than 15 percent fine sand or coarser sand. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (3 to 5 moist), and chroma of 1 or 2. It is clay loam or silty clay loam and in some pedons is stratified with coarser material.

Egas series

The Egas series consists of deep, poorly drained, slowly permeable soils formed in alluvium. These soils are on bottom land. Slopes are less than 2 percent.

Egas soils are similar to Durrstein, Grat, and Hoven soils. Durrstein and Hoven soils have natric horizons. Grat soils have argillic horizons and are moderately deep over sand and gravel.

Typical pedon of Egas silty clay loam 200 feet north and 255 feet west of the southeast corner of sec. 20, T. 112 N., R. 64 W.

A11—0 to 1 inch; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; mildly alkaline; clear smooth boundary.

A12—1 inch to 3 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; mildly alkaline; gradual wavy boundary.

AC1casa—3 to 8 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; very hard, very firm, sticky and plastic; common fine striations of salts; many fine segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

AC2gsa—8 to 18 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; very hard, very firm, sticky and plastic; common fine striations of salts; few fine dark segregations (oxides); common medium segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C1g—18 to 46 inches; gray (5Y 5/1) silty clay loam, dark gray (5Y 4/1) moist; massive; hard, firm, sticky and plastic; few fine striations of salts; few fine dark segregations (oxides); common fine medium segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C2g—46 to 60 inches; light gray (5Y 7/1) clay loam, gray (5Y 5/1) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine clusters of gypsum; few fine faint dark segregations (oxides); violent effervescence; moderately alkaline.

The thickness of the solum ranges from 8 to 35 inches, and the thickness of mollic epipedon ranges from 8 to 24 inches. Accumulations of salts are at the surface or within 7 inches of the surface. Free carbonates are at the surface or within 10 inches of the surface.

The A11 horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is silt loam in some pedons. It is mildly alkaline or moderately alkaline and is 1 inch or 2 inches thick. The A12 and AC horizons have hue of 10YR, 2.5Y, or 5Y; value of 4 or 5 (2 or 3 moist); and chroma of 1 or 2. They are mildly alkaline to strongly alkaline. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 1 or 2. It is moderately alkaline or strongly alkaline. Some pedons have thin layers of coarser material below a depth of 40 inches.

Elsmere series

The Elsmere series consists of deep, somewhat poorly drained soils formed in outwash sand underlain by glacial till at a depth of 40 to 60 inches. These soils are on outwash plains and terraces in the uplands. Permeability is rapid in the upper part and moderately slow in the lower part. Slopes range from 0 to 2 percent.

Elsmere soils are near Forestburg, Loup, and Shue soils. Forestburg and Shue soils have a loamy IIC horizon within a depth of 40 inches. Loup soils are poorly drained.

Typical pedon of Elsmere loamy fine sand, loamy substratum, 2,100 feet west and 75 feet north of the southeast corner of sec. 19, T. 109 N., R. 60 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) loamy fine sand, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak medium granular; soft, very friable; slightly acid; abrupt smooth boundary.

A12—8 to 18 inches; dark gray (10YR 4/1) loamy fine sand, very dark gray (10YR 3/1) moist; very weak fine and medium prismatic structure parting to weak medium subangular blocky; soft, very friable; slightly acid; gradual smooth boundary.

AC—18 to 24 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; few fine faint mottles of dark yellowish brown (10YR 4/4); very weak medium prismatic structure parting to very weak coarse subangular blocky; soft, very friable; slightly acid; gradual smooth boundary.

C1—24 to 34 inches; grayish brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) moist; common medium faint mottles of dark yellowish brown (10YR 4/4 and 3/4); single grained; loose; few fine dark concretions (oxides); neutral; gradual smooth boundary.

C2—34 to 44 inches; grayish brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) moist; common medium distinct mottles of dark yellowish brown (10YR 4/4); single grained; loose; few fine dark concretions (oxides); neutral; gradual smooth boundary.

IIC3—44 to 60 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine segregations of lime; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 16 to 36 inches, and the depth to free carbonates ranges from 20 to more than 60 inches. The mollic epipedon is 10 to 20 inches thick. Depth to the IIC horizon ranges from 40 to 60 inches or more.

The A horizon has color value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is 10 to 20 inches thick and in places is fine sandy loam. It ranges from medium acid to mildly alkaline. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2. It is loamy sand in some pedons. It ranges from medium acid to mildly alkaline. The IIC horizon is loam or clay loam and is mildly alkaline or moderately alkaline. It is below a depth of 60 inches in some pedons.

Enet series

The Enet series consists of well drained soils formed in loamy alluvium that is moderately deep over gravelly sand. These soils are on upland terraces. Permeability is moderate in the upper part and rapid in the lower part. Slopes range from 0 to 6 percent.

Enet soils are near Delmont, Grat, and Spottswood soils. Delmont soils have a mollic epipedon that is less than 20 inches thick and are shallow over sand and gravel. Grat soils are poorly drained and are fine textured. Spottswood soils have a seasonal high water table and are moderately well drained.

Typical pedon of Enet loam, 0 to 2 percent slopes, 1,550 feet north and 725 feet west of the southeast corner of sec. 32, T. 112 N., R. 60 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable; neutral; abrupt smooth boundary.

B21—7 to 18 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky; neutral; gradual wavy boundary.

B22—18 to 22 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky; neutral; gradual wavy boundary.

B3—22 to 25 inches; dark brown (10YR 4/3) sandy loam, very dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, very friable; neutral; abrupt wavy boundary.

IIC1—25 to 31 inches; yellowish brown (10YR 5/4) gravelly sand, brown (10YR 4/3) moist; single grained; loose; slight effervescence; mildly alkaline; gradual wavy boundary.

IIC2—31 to 45 inches; brown (10YR 5/3) gravelly sand, dark brown (10YR 4/3) moist; single grained; loose; slight effervescence; mildly alkaline; gradual wavy boundary.

IIC3—45 to 60 inches; light brownish gray (10YR 6/2) gravelly sand, dark grayish brown (10YR 4/2) moist; single grained; loose; strong effervescence; mildly alkaline.

The solum and the mollic epipedon range from 20 to 40 inches in thickness. The depth to free carbonates and to the underlying sand and gravel ranges from 20 to 40 inches.

The A horizon has color value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is silt loam or fine sandy loam in some pedons and is slightly acid or neutral. It is 6 to 9 inches thick. The B2 horizon has color value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is clay loam in some pedons and is neutral or mildly alkaline. The B3 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 loam in some pedons and is neutral or mildly alkaline. Some pedons have a C horizon. The IIC horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is mildly alkaline or moderately alkaline. Some pedons have a IIIC horizon of loam or clay loam glacial till at a depth of 40 to 60 inches.

Ethan series

The Ethan series consists of deep, well drained soils formed in glacial till. These soils are on uplands. Permeability is moderate in the upper part and moderately slow in the lower part. Slopes range from 2 to 21 percent.

Ethan soils are near Betts, Hand, and Houdek soils. Betts soils lack a mollic epipedon. Hand and Houdek soils are deeper to free carbonates than Ethan soils. In addition, Houdek soils have argillic horizons.

Typical pedon of Ethan loam, in an area of Houdek-Ethan loams, 6 to 9 percent slopes, 1,915 feet east and 180 feet south of the northwest corner of sec. 16, T. 111 N., R. 64 W.

A1—0 to 6 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak medium granular; slightly hard, friable; slightly acid; gradual wavy boundary.

B2—6 to 9 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky; slightly acid; gradual wavy boundary.

B31ca—9 to 17 inches; grayish brown (2.5Y 5/2) light clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky; common medium segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

B32ca—17 to 28 inches; light brownish gray (2.5Y 6/2) light clay loam, light olive brown (2.5Y 5/3) moist; weak fine and medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky; few fine segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

C1—28 to 39 inches; light gray (2.5Y 7/2) clay loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky; few fine segregations of lime; slight effervescence; moderately alkaline; gradual wavy boundary.

C2—39 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable, slightly sticky; few fine segregations of lime; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 35 inches. The mollic epipedon is 7 to 10 inches thick. Free carbonates are at the surface or within 9 inches of the surface.

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 is slightly acid to mildly alkaline and is 4 to 7 inches thick. The B2 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 light clay loam in some pedons. The B3ca horizon has color value of 5 to 7 (4 to 6 moist) and chroma of 2 or 3. Some pedons lack a B horizon and have an AC horizon. The C horizon has hue of 2.5Y or 5Y, value of 5 to 8 (4 to 6 moist), and chroma of 2 to 4. It is stratified with loam, silt loam, or fine sandy loam in some pedons and is mildly alkaline to strongly alkaline.

Forestburg series

The Forestburg series consists of deep, moderately well drained soils formed in sandy sediments underlain by glacial drift or glacial till at a depth of 20 to 40 inches. These soils are on uplands. Permeability is rapid in the upper part and moderately slow in the lower part. Slopes range from 0 to 6 percent.

Forestburg soils are near Blendon, Doger, and Shue soils and are similar to Carthage soils. Blendon and Doger soils lack a contrasting IIC horizon within a depth of 40 inches. Shue soils are somewhat poorly drained. Carthage soils are coarse-loamy.

Typical pedon of Forestburg loamy fine sand, 0 to 3 percent slopes, 1,300 feet east and 140 feet south of the northwest corner of sec. 34, T. 109 N., R. 61 W.

A11—0 to 6 inches; dark gray (10YR 4/1) loamy fine sand, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; loose, very friable; neutral; clear smooth boundary.

A12—6 to 19 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; single grained; soft, very friable; neutral; clear wavy boundary.

AC—19 to 25 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to single grained; soft, very friable; neutral; clear wavy boundary.

C1—25 to 29 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; few fine distinct mottles, dark reddish brown (5YR 3/3) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable; few fine dark concretions of iron and manganese oxides; neutral; clear irregular boundary.

IIC2ca—29 to 50 inches; light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/4) moist; common fine prominent mottles, reddish brown (5YR 5/4) moist; massive; slightly hard, friable; common fine and medium segregations of lime; strong effervescence; moderately alkaline; clear smooth boundary.

IIC3—50 to 60 inches; light gray (2.5Y 7/2 and 5Y 7/2) stratified silt loam and very fine sand, light olive brown (2.5Y 5/4) and olive gray (5Y 5/2) moist; common medium prominent mottles of reddish brown (5YR 5/4 and 4/4) and common medium distinct mottles, very pale brown (10YR 7/4) and brownish yellow (10YR 6/6) moist; massive; hard, friable; few medium segregations of lime; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 33 inches. The mollic epipedon is 10 to 20 inches thick. The depth to free carbonates and to the contrasting IIC horizon ranges from 20 to 40 inches.

The A horizon has color value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is loamy sand or sandy loam in some pedons and is slightly acid or neutral. It is 15 to 23 inches thick. The AC horizon has color value of 4 to 6 (3 or 4 moist) and chroma of 1 to 3. It is loamy fine sand in some pedons. Some pedons lack a C horizon above the IIC horizon. The IIC horizon has hue of 10YR, 2.5Y, or 5Y; value of 5 to 7 (4 to 6 moist); and chroma of 2 to 4. It is clay loam in some pedons and is mildly alkaline or moderately alkaline.

Grat series

The Grat series consists of deep, poorly drained soils formed in loamy and clayey alluvium underlain by sand and gravel at a depth of 20 to 40 inches. These soils are on bottom land and in swales on outwash plains. Permeability is slow in the subsoil and rapid in the underlying sand and gravel. Slopes range from 0 to 2 percent.

Grat soils are near Delmont, Durrstein, Egas, Enet, and Spottswood soils. Delmont, Enet, and Spottswood soils are better drained than Grat soils and are fine-loamy. Durrstein soils have natric horizons. Egas soils have visible accumulations of salts within a depth of 7 inches.

Typical pedon of Grat loam 2,230 feet east and 80 feet south of the northwest corner of sec. 9, T. 109 N., R. 62 W.

A11—0 to 3 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium subangular blocky and moderate medium granular structure; slightly hard, friable; neutral; gradual smooth boundary.

A12—3 to 5 inches; dark gray (10YR 4/1) heavy loam, black (10YR 2/1) moist; weak medium platy structure parting to moderate fine and medium granular; slightly hard, slightly sticky and slightly plastic; neutral; gradual wavy boundary.

B21t—5 to 8 inches; dark gray (10YR 4/1) heavy clay loam, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable and firm, sticky and plastic; few fine segregations of lime; slight effervescence; neutral; gradual wavy boundary.

B22t—8 to 14 inches; gray (10YR 5/1) heavy clay loam, dark gray (10YR 4/1) moist; few fine prominent mottles, dark yellowish brown (10YR 4/6) moist; moderate medium prismatic structure parting to moderate and strong medium subangular blocky; hard, firm, sticky and plastic; few fine dark concretions (oxides); disseminated and common fine segregations of lime; strong effervescence (8 percent calcium carbonate); moderately alkaline; gradual wavy boundary.

B3gca—14 to 20 inches; gray (5Y 5/1) clay loam, dark gray (5Y 4/1) moist; common fine prominent mottles, strong brown (7.5YR 5/6) and light olive brown (2.5Y 5/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine dark concretions (oxides); disseminated and common medium segregations of lime; strong effervescence (12 percent calcium carbonate); moderately alkaline; gradual wavy boundary.

C1gca—20 to 31 inches; white (2.5Y 8/2) clay loam, light brownish gray (2.5Y 6/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few medium dark segregations (oxides); violent effervescence (40 percent calcium carbonate); moderately alkaline; abrupt wavy boundary.

IIC2g—31 to 55 inches; light brownish gray (2.5Y 6/2) stratified sand and gravel, grayish brown (2.5Y 5/2) moist; many fine and medium distinct mottles, strong brown (7.5YR 5/6) moist; single grained; loose; common fine dark concretions (oxides); slight effervescence; mildly alkaline; abrupt wavy boundary.

IIIC3g—55 to 60 inches; light gray (5Y 7/2) clay loam, olive gray (5Y 5/2) moist; many medium distinct mottles, strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine dark concretions (oxides); strong effervescence; mildly alkaline.

The thickness of the solum ranges from 8 to 28 inches, and the depth to carbonates is 3 to 12 inches. The mollic epipedon is 6 to 18 inches thick and commonly includes part or all of the B2t horizon.

The A horizon has color value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It typically is loam or light clay loam but is silt loam in some pedons. It is slightly acid or neutral and is 3 to 6 inches thick.

The B2t horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 to 5 moist), and chroma of 1 or 2. It is clay loam, clay, or silty clay loam averaging between 35 and 50 percent clay. It is neutral to moderately alkaline. The B3ca horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 1 or 2. It is clay loam, clay, silty clay loam, or silty clay and is mildly alkaline or moderately alkaline.

The C horizon has hue of 2.5Y or 5Y, value of 5 to 8 (4 to 6 moist), and chroma of 2 to 4. It is clay loam, clay, or silty clay loam and is mildly alkaline or moderately alkaline. The IIC horizon is at a depth of 20 to 40 inches. The IIC and IIIC horizons are mildly alkaline or moderately alkaline. Some pedons lack a IIIC horizon.

Great Bend series

The Great Bend series consists of deep, well drained, moderately permeable soils formed in calcareous glaciolacustrine sediments. These soils are on glacial lake plains. Slopes range from 0 to 6 percent.

Great Bend soils are near Zell soils and are similar to Hand, LaDelle, and Mobridge soils. Hand soils are fine-loamy. LaDelle and Mobridge soils have a mollic epipedon that is more than 20 inches thick. Zell soils are coarse-silty and have free carbonates within a depth of 10 inches.

Typical pedon of Great Bend silt loam, in an area of Great Bend-Zell silt loams, 2 to 6 percent slopes, 285 feet north and 120 feet west of the southeast corner of sec. 3, T. 113 N., R. 62 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate medium and fine granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

B2—6 to 14 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, slightly sticky; neutral; gradual wavy boundary.

B3—14 to 20 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky; neutral; gradual wavy boundary.

C1—20 to 40 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky; slight effervescence; mildly alkaline; gradual wavy boundary.

C2ca—40 to 52 inches; light gray (2.5Y 7/2) and white (2.5Y 8/2) silt loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky; common fine segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

C3—52 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; few fine faint mottles of strong brown (7.5YR 5/6); massive; hard, friable, slightly sticky and slightly plastic; few medium segregations of lime; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 12 to 28 inches, and the depth to free carbonates ranges from 11 to 26 inches. The mollic epipedon is 7 to 16 inches thick and extends into the B horizon.

The A horizon has color value of 3 to 5 (2 or 3 moist) and chroma of 1.5 or less. It is slightly acid or neutral and is 5 to 10 inches thick. The B 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 silty clay loam in some pedons and is neutral to moderately alkaline. The C horizon has a color value of 6 to 8 (4 to 6 moist) and chroma of 2 to 4. It commonly is laminated silt and clay or is silt, silt loam, and very fine sand. It is mildly alkaline to strongly alkaline.

Hand series

The Hand series consists of deep, well drained, moderately permeable soils formed in stratified loamy glacial drift. These soils are on uplands. Slopes range from 0 to 9 percent.

Hand soils are near Betts, Bonilla, Ethan, and Houdek soils. Betts and Ethan soils have free carbonates within a depth of 10 inches. In addition, Betts soils lack a mollic epipedon. Bonilla soils have a mollic epipedon that is more than 20 inches thick. Houdek soils have argillic horizons.

Typical pedon of Hand loam, in an area of Hand-Bonilla loams, 3 to 6 percent slopes, 2,500 feet east and 310 feet south of the northwest corner of sec. 32, T. 111 N., R. 64 W.

A1—0 to 9 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium granular structure; slightly hard, friable, slightly sticky; neutral; gradual smooth boundary.

B21—9 to 14 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky; neutral; gradual smooth boundary.

B22—14 to 18 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium and coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky; neutral; gradual wavy boundary.

B3ca—18 to 29 inches; light gray (2.5Y 7/2) light clay loam, grayish brown (2.5Y 5/2) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky; thin lenses of very fine sandy loam; common fine and few medium segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C—29 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable, slightly sticky; thin lenses of loam and very fine sandy loam; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 20 to 38 inches. The depth to free carbonates is 12 to 24 inches. The mollic epipedon is 8 to 20 inches thick and extends into the B2 horizon.

The A horizon has color value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is silt loam in some pedons and is medium acid to neutral. It is 6 to 10 inches thick. The B2 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 silt loam in some pedons and is slightly acid or neutral. The B3ca horizon has color value of 6 or 7 (4 or 5 moist) and chroma of 2 or 3. It is mildly alkaline or moderately alkaline. The C horizon has color value of 6 or 7 (4 or 5 moist) and chroma of 1 to 4. It commonly is stratified with material as coarse as loamy fine sand, but in some pedons it is loam or clay loam glacial till. It is mildly alkaline or moderately alkaline.

Houdek series

The Houdek series consists of deep, well drained soils formed in glacial till. These soils are on uplands. Permeability is moderate in the solum and moderately slow in the underlying glacial till. Slopes range from 0 to 9 percent.

Houdek soils are near Beadle, Betts, Ethan, Hand, and Prosper soils. Beadle soils are fine textured. Betts, Ethan, and Hand soils lack argillic horizons. In addition, Betts and Ethan soils have free carbonates within a depth of 10 inches. Prosper soils have a mollic epipedon that is more than 20 inches thick.

Typical pedon of Houdek loam, in an area of Houdek-Prosper loams, 0 to 2 percent slopes, 2,375 north and 462 feet west of the southeast corner of sec. 15, T. 112 N., R. 62 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky; neutral; abrupt smooth boundary.

B21t—7 to 15 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; neutral; clear wavy boundary.

B22t—15 to 20 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; dark grayish brown (10YR 4/2) coats on faces of peds; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; mildly alkaline; clear wavy boundary.

B3ca—20 to 29 inches; light brownish gray (2.5Y 6/2) clay loam, light olive brown (2.5Y 5/4) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine and medium segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C1ca—29 to 37 inches; light brownish gray (2.5Y 6/2) clay loam, olive brown (2.5Y 4/4) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common medium and fine segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

C2—37 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, olive brown (2.5Y 4/4) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common dark stains (oxides); few fine nests of gypsum; few fine segregations of lime; strong effervescence; moderately alkaline.

The solum is 22 to 32 inches thick. The depth to free carbonates is 14 to 24 inches. The mollic epipedon is 8 to 20 inches thick.

The A horizon has color value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is silt loam in some pedons and is slightly acid or neutral. It is 5 to 8 inches thick. The B2t horizon has color value of 3 to 5 (2 to 4 moist) and chroma of 2 or 3. It is neutral to moderately alkaline. The B3ca horizon has hue of 10YR or 2.5Y, value of 4 to 6 (4 or 5 moist), and chroma of 2 to 4. It is mildly alkaline or moderately alkaline. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is mildly alkaline or moderately alkaline.

Hoven series

The Hoven series consists of deep, poorly drained, very slowly permeable soils formed in alluvium. These soils are in closed depressions. They have natric horizons. Slopes are less than 1 percent.

Hoven soils are similar to Durrstein, Jerauld, and Tetonka soils. Durrstein and Jerauld soils have visible accumulations of salts within a depth of 16 inches. Tetonka soils lack natric horizons.

Typical pedon of Hoven silt loam 1,590 feet west and 425 feet north of the southeast corner of sec. 15, T. 112 N., R. 62 W.

A21—0 to 1 inch; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak thin platy structure; soft, very friable; neutral; clear smooth boundary.

A22—1 inch to 4 inches; gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; few fine faint mottles of yellowish brown (10YR 5/6); weak thin platy structure parting to weak fine granular; soft, very friable; neutral; clear smooth boundary.

B21t—4 to 10 inches; gray (10YR 5/1) clay, very dark gray (10YR 3/1) moist; thin coats of gray (10YR 6/1) on tops of columns; strong medium and coarse columnar structure parting to strong medium and fine blocky; very hard, very firm, sticky and plastic; mildly alkaline; gradual smooth boundary.

B22t—10 to 23 inches; gray (10YR 5/1) clay, very dark gray (10YR 3/1) moist; moderate coarse prismatic structure parting to strong medium and fine blocky; very hard, very firm, sticky and plastic; moderately alkaline; gradual wavy boundary.

B3—23 to 34 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; very hard, firm, sticky and plastic; few fine segregations of lime; moderately alkaline, clear wavy boundary.

C1ca—34 to 44 inches; light brownish gray (2.5Y 6/2) and light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; common medium prominent mottles of dark yellowish brown (10YR 4/4); weak medium and coarse subangular blocky structure; hard, friable, sticky and plastic; few fine nests of gypsum; common fine dark segregations (oxides); common medium segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—44 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; many medium distinct mottles of dark yellowish brown (10YR 4/6); massive; hard, friable, sticky and plastic; few fine nests of gypsum; many fine dark segregations (oxides); strong effervescence; moderately alkaline.

The thickness of the solum ranges from 14 to 42 inches. The depth to free carbonates ranges from 16 to 32 inches.

Some pedons have an A1 horizon. This horizon is 1 inch to 4 inches thick. The A2 horizon has color value of 5 to 7 (2 to 4 moist) and chroma of 1 or 2. It is medium acid to neutral and is 2 to 5 inches thick. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is clay, clay loam, or silty clay. It ranges from slightly acid to moderately alkaline. Some pedons lack a B3 horizon. The C horizon has hue of 2.5Y or 5Y, value of 4 to 7 (3 to 5 moist), and chroma of 1 to 3. It is clay loam, silty clay, or clay and is mildly alkaline to strongly alkaline.

Jerauld series

The Jerauld series consists of deep, moderately well drained, slowly or very slowly permeable soils formed in local alluvium and glacial till. These soils are on uplands. They have natric horizons. Slopes range from 0 to 3 percent.

Jerauld series are near Dudley, Hoven, and Stickney soils and are similar to Durrstein soils. Dudley and Stickney soils do not have visible salts within a depth of 16 inches. Durrstein and Hoven soils are poorly drained.

Typical pedon of Jerauld silt loam, in an area of Dudley-Jerauld silt loams, 0 to 3 percent slopes, 1,525 feet west and 225 feet north of the southeast corner of sec. 4, T. 110 N., R. 62 W.

A2—0 to 2 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak medium platy structure parting to weak fine granular; soft, very friable; slightly acid; abrupt smooth boundary.

B2t—2 to 7 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; thin coats of gray (10YR 6/1) on tops of columns; moderate medium columnar structure parting to strong medium blocky; very hard, very firm, sticky and plastic; mildly alkaline; gradual smooth boundary.

B3sa—7 to 11 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate fine subangular blocky structure; hard, firm, sticky and plastic; common fine striations and clusters of salts; slight effervescence; moderately alkaline; gradual smooth boundary.

C1cacs—11 to 19 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine clusters of gypsum crystals; common fine segregations of lime; strong effervescence; strongly alkaline; gradual wavy boundary.

C2cs—19 to 27 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine clusters of gypsum crystals; few fine segregations of lime; strong effervescence; strongly alkaline; gradual wavy boundary.

C3—27 to 40 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common medium distinct mottles of yellowish brown (10YR 5/8); massive; hard, friable, slightly sticky and slightly plastic; few fine clusters of gypsum crystals; few fine distinct dark concretions (oxides); few fine segregations of lime; strong effervescence; strongly alkaline; gradual wavy boundary.

C4—40 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; common medium distinct mottles of yellowish brown (10YR 5/8); massive; hard, friable, slightly sticky and slightly plastic; few fine clusters of gypsum crystals; few fine distinct dark concretions (oxides); few medium segregations of lime; strong effervescence; moderately alkaline.

The thickness of the solum is 10 to 20 inches. The depth to free carbonates is 6 to 12 inches.

Some pedons have an A1 horizon. This horizon is 1 inch to 2 inches thick. The A2 horizon has hue of 10YR or 2.5Y, value of 5 to 7 (3 to 5 moist), and chroma of 1 or 2. It is loam in some pedons and is medium acid to neutral. It is 1 inch to 3 inches thick. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is silty clay, clay, or clay loam averaging between 35 and 60 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 1 to 4. It is silty clay loam in some pedons and is mildly alkaline to strongly alkaline.

LaDelle series

The LaDelle series consists of deep, moderately well drained, moderately permeable soils formed in silty alluvium. These soils are on stream terraces and bottom land. Slopes are less than 2 percent.

LaDelle soils are similar to Bon, Davis, Lamo, and Mobridge soils. Bon and Davis soils are fine-loamy. In addition, Davis soils are deeper to free carbonates than LaDelle soils. Lamo soils are somewhat poorly drained. Mobridge soils have argillic horizons.

Typical pedon of LaDelle silt loam 1,280 feet north and 1,056 feet east of the southwest corner of sec. 11, T. 113 N., R. 62 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

A12—6 to 12 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; slightly hard, very friable; mildly alkaline; gradual smooth boundary.

A13—12 to 16 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak medium and coarse prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky; slight effervescence; mildly alkaline; gradual smooth boundary.

C1—16 to 29 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky; slight effervescence; mildly alkaline; gradual smooth boundary.

C2—29 to 60 inches; grayish brown (2.5Y 5/2) silt loam, very dark grayish brown (2.5Y 3/2) moist; few fine faint mottles of dark brown (10YR 3/3); massive; slightly hard, friable, slightly sticky; slight effervescence; mildly alkaline.

The mollic epipedon is 20 to 40 inches thick. Free carbonates are at the surface or within a depth of 20 inches.

The A horizon has color value of 3 or 4 (2 or 3 moist) and chroma of 1.5 or less. It is loam in some pedons and is neutral or mildly alkaline. It is 12 to 22 inches thick. The C horizon has color value of 3 to 7 (2 to 5 moist) and chroma of 1 to 3. It is mildly alkaline or moderately alkaline. In some pedons it is stratified with thin layers of coarser material below a depth of 40 inches. Some pedons have a buried A horizon.

Lamo series

The Lamo series consists of deep, somewhat poorly drained, moderately slowly permeable soils formed in calcareous silty alluvium. These soils are on bottom land. Slopes are less than 2 percent.

Lamo soils are similar to Bon, Davis, and LaDelle soils. Bon, Davis, and LaDelle soils are moderately well drained. In addition, Bon and Davis soils are fine-loamy.

Typical pedon of Lamo silt loam 1,290 feet east and 200 feet north of the southwest corner of sec. 33, T. 110 N., R. 61 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; slightly hard, friable; mildly alkaline; abrupt smooth boundary.

A12—8 to 13 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak medium granular; slightly hard, friable; slight effervescence; mildly alkaline; gradual smooth boundary.

AC1—13 to 18 inches; gray (10YR 5/1) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, friable, slightly sticky; strong effervescence; mildly alkaline; gradual smooth boundary.

AC2—18 to 26 inches; gray (10YR 5/1) silty clay loam, very dark grayish brown (10YR 3/2) moist; common fine faint mottles of dark yellowish brown (10YR 4/4); weak medium prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; strong effervescence; mildly alkaline; abrupt smooth boundary.

C—26 to 60 inches; gray (10YR 5/1) silty clay loam, dark gray (10YR 4/1) moist; few fine faint mottles of dark brown (10YR 3/3); weak medium subangular blocky structure; hard, firm, sticky and plastic; common fine segregations of lime; strong effervescence; mildly alkaline.

The solum and the mollic epipedon are 24 to 35 inches thick. Free carbonates are at the surface or within a depth of 10 inches. The soil is mildly alkaline or moderately alkaline.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. It is 12 to 20 inches thick. The AC horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 moist), and chroma of 1 or 2. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 or 2. It is light silty clay in some pedons.

Lane series

The Lane series consists of deep, moderately well drained, moderately slowly or slowly permeable soils formed in alluvium. These soils are on upland flats, alluvial fans, and stream terraces. Slopes range from 0 to 2 percent.

Lane soils are near Beadle, Mobridge, and Oko soils. Beadle and Oko soils are well drained and have a mollic epipedon that is less than 20 inches thick. Mobridge soils are fine-silty.

Typical pedon of Lane silt loam, 0 to 2 percent slopes, 2,340 feet north and 175 feet east of the southwest corner of sec. 25, T. 109 N., R. 65 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; neutral; abrupt smooth boundary.

B21t—8 to 18 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; hard, firm, sticky and plastic; shiny films on faces of peds; neutral; gradual wavy boundary.

B22t—18 to 24 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; very hard, firm, sticky and plastic; thin coats of dark gray (10YR 4/1) on faces of peds; shiny films on faces of peds; slight effervescence; mildly alkaline; gradual wavy boundary.

B3ca—24 to 38 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; few fine segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

C1ca—38 to 44 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common fine and medium segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

C2—44 to 60 inches; grayish brown (2.5Y 5/2) heavy silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 26 to 54 inches. The depth to free carbonates is 8 to 22 inches. The mollic epipedon is 20 to 36 inches thick and includes all or part of the B2t horizon.

The A horizon has color value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is loam or silty clay loam in some pedons and is slightly acid or neutral. It is 8 to 14 inches thick. The B2t horizon has color value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is clay loam, clay, silty clay, or silty clay loam averaging between 35 and 50 percent clay. 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 silty clay, silty clay loam, or clay loam and are mildly alkaline or moderately alkaline. Some pedons are stratified with lenses of coarser material below a depth of 40 inches.

Loup series

The Loup series consists of deep, poorly drained, rapidly permeable soils formed in sandy alluvium or eolian sand. These soils are in swales on uplands. Slopes range from 0 to 2 percent.

Loup soils are near Elsmere and Shue soils. Elsmere and Shue soils are somewhat poorly drained. In addition, a contrasting loamy IIC horizon is at a depth of 40 to 60 inches in Elsmere soils and at a depth of 20 to 40 inches in Shue soils.

Typical pedon of Loup loamy fine sand 1,990 feet east and 80 feet north of the southwest corner of sec. 26, T. 112 N., R. 64 W.

Ap—0 to 10 inches; dark gray (10YR 4/1) loamy fine sand, very dark gray (10YR 3/1) moist; weak fine and medium granular structure; soft, very friable; neutral; abrupt smooth boundary.

A12—10 to 16 inches; dark gray (10YR 4/1) loamy fine sand, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable; neutral; gradual smooth boundary.

AC—16 to 20 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; few fine faint mottles of dark yellowish brown (10YR 4/4); weak medium and fine subangular blocky structure; soft, very friable; few fine faint segregations (oxides); neutral; gradual smooth boundary.

C1—20 to 30 inches; light brownish gray (10YR 6/2) fine sand, grayish brown (10YR 5/2) moist; common medium distinct mottles of dark yellowish brown (10YR 4/6); single grained; loose; common medium dark segregations (oxides); mildly alkaline; gradual smooth boundary.

C2—30 to 60 inches; light brownish gray (2.5Y 6/2) fine sand, grayish brown (2.5Y 5/2) moist; many medium distinct mottles of dark brown (7.5YR 4/4); single grained; loose; many medium dark segregations (oxides); mildly alkaline.

The mollic epipedon is 7 to 16 inches thick. The solum is 7 to 20 inches thick.

The A horizon has color value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is fine sandy loam in some pedons and is neutral to moderately alkaline. It is 10 to 16 inches thick. The C horizon has color value of 6 or 7 (5 or 6 moist) and chroma of 1 or 2. It is mildly alkaline or moderately alkaline. Loamy material is below a depth of 40 inches in some pedons.

Mobridge series

The Mobridge series consists of deep, moderately well drained, moderately permeable soils formed in silty alluvium. These soils are in broad drainageways and in swales. Slopes range from 0 to 2 percent.

Mobridge soils are similar to LaDelle soils and are near Lane soils. LaDelle soils lack argillic horizons and have free carbonates within a depth of 20 inches. Lane soils are fine textured.

Typical pedon of Mobridge silt loam 2,515 feet east and 260 feet north of the southwest corner of sec. 4, T. 113 N., R. 65 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak medium granular structure; slightly hard, friable; slightly acid; gradual smooth boundary.

A12—6 to 14 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak medium granular; slightly hard, friable, slightly sticky; slightly acid; gradual smooth boundary.

B21t—14 to 21 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; neutral; gradual smooth boundary.

B22t—21 to 28 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, slightly sticky and slightly plastic; neutral; gradual smooth boundary.

B31—28 to 34 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; mildly alkaline; gradual smooth boundary.

B32—34 to 40 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine striations of lime; slight effervescence; mildly alkaline; gradual smooth boundary.

Cca—40 to 54 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine striations of lime; strong effervescence; moderately alkaline; gradual smooth boundary.

Ab—54 to 65 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common medium segregations of lime; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 21 to 46 inches. The depth to free carbonates ranges from 20 to 34 inches. The mollic epipedon is 22 to 34 inches thick.

The A horizon has color value of 3 or 4 (2 or 3 moist) and chroma of 1. It is silty clay loam in some pedons and is slightly acid or neutral. It is 8 to 14 inches thick. The B2t horizon has color value of 3 or 4 (2 to 4 moist) and chroma of 1 or 2. It is clay loam in some pedons and is neutral or mildly alkaline. The B3 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 mildly alkaline or moderately alkaline. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is clay loam in some pedons and is mildly alkaline or moderately alkaline. Some pedons lack a buried A horizon.

Oko series

The Oko series consists of deep, well drained, slowly permeable soils formed in fine textured glacial till. These soils are on uplands. Slopes range from 3 to 21 percent.

Oko soils are near Beadle and Lane soils. Beadle soils commonly have less clay in the B2t horizon than Oko soils and have free carbonates below a depth of 12 inches. Lane soils have a mollic epipedon that is more than 20 inches thick.

Typical pedon of Oko clay loam, 9 to 21 percent slopes, 100 feet south and 120 feet west of the northeast corner of sec. 19, T. 109 N., R. 65 W.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure parting to moderate medium and fine granular; slightly hard, friable, slightly sticky and slightly plastic; mildly alkaline; gradual smooth boundary.

B2tca—5 to 13 inches; grayish brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to strong medium subangular blocky; very hard, firm, sticky and plastic; common fine segregations of lime; slight effervescence; moderately alkaline; gradual smooth boundary.

B3ca—13 to 20 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; very hard, firm, sticky and plastic; many medium and coarse segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C1ca—20 to 36 inches; light olive gray (5Y 6/2) and olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few fine nests of gypsum; few medium segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—36 to 43 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 4/2) moist; massive; hard, firm, sticky and plastic; many medium nests of gypsum; common medium dark segregations (oxides); 25 to 35 percent fine fragments of soft shale; slight effervescence; moderately alkaline; gradual wavy boundary.

C3—43 to 60 inches; light gray (5Y 6/1) clay, olive gray (5Y 5/2) moist; massive; hard, firm, sticky and plastic; few fine dark segregations (oxides); 30 to 50 percent fine fragments of soft shale; slight effervescence; mildly alkaline.

The solum is 15 to 28 inches thick. The depth to free carbonates is 5 to 12 inches. The mollic epipedon is 7 to 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 color value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is loam in some pedons and is neutral or mildly alkaline. It is 2 to 5 inches thick. Some pedons have a thin B21t horizon of clay loam or clay. The B2tca horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 1 or 2. It averages between 40 and 60 percent clay. It is mildly alkaline or moderately alkaline. The B3 and C horizons have color value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. They are mildly alkaline or moderately alkaline. Bedded shale is at a depth of 40 to 60 inches in some pedons.

Prosper series

The Prosper series consists of deep, moderately well drained soils formed in alluvium and glacial till. These soils are on foot slopes and in swales on uplands. Permeability is moderate in the upper part and moderately slow in the lower part. Slopes range from 0 to 6 percent.

Prosper soils are similar to Bonilla soils and are near Beadle, Davison, and Houdek soils. Beadle and Houdek soils have a mollic epipedon that is less than 20 inches thick. Bonilla soils lack argillic horizons. Davison soils have calcic horizons.

Typical pedon of Prosper loam, in an area of Houdek-Prosper loams, 0 to 2 percent slopes, 2,475 feet south and 255 feet east of the northwest corner of sec. 11, T. 109 N., R. 61 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky; slightly acid; abrupt smooth boundary.

A12—7 to 10 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky; slightly acid; gradual smooth boundary.

B21t—10 to 20 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; neutral; gradual wavy boundary.

B22t—20 to 23 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and slightly plastic; neutral; gradual wavy boundary.

B31—23 to 27 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and slightly plastic; few fine striations of lime; slight effervescence; mildly alkaline; gradual wavy boundary.

B32ca—27 to 34 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak medium and coarse blocky structure; hard, friable, slightly sticky and slightly plastic; common medium and fine segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C1—34 to 43 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; common medium distinct mottles of light gray (2.5Y 7/2); massive; hard, friable, slightly sticky and slightly plastic; few fine segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—43 to 60 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; common medium distinct mottles of light gray (2.5Y 7/2) and yellowish brown (10YR 5/6); massive; hard, friable, slightly sticky and slightly plastic; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 24 to 48 inches. The depth to free carbonates ranges from 20 to 34 inches. The mollic epipedon is 20 to 30 inches thick and extends into the B2t horizon.

The A horizon has color value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is silt loam in some pedons and is slightly acid or neutral. It is 7 to 13 inches thick. The B2t horizon has color value of 3 to 5 (2 to 4 moist) and chroma of 1 to 3. It is silty clay loam in some pedons and 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 mildly alkaline or moderately alkaline.

Shue series

The Shue series consists of deep, somewhat poorly drained soils formed in sandy material overlying glacial till. These soils are in swales and shallow depressions on uplands. Permeability is rapid in the sandy material and moderately slow in the glacial till. Slopes are less than 2 percent.

Shue soils are near Carthage, Elsmere, Forestburg, and Loup soils. Carthage soils are coarse-loamy and are moderately well drained. Elsmere and Loup soils do not have a loamy IIC horizon within a depth of 40 inches. In addition, Loup soils are poorly drained. Forestburg soils are moderately well drained.

Typical pedon of Shue loamy fine sand 2,475 feet west and 350 feet south of the northeast corner of sec. 2, T. 111 N., R. 62 W.

Ap—0 to 10 inches; dark gray (10YR 4/1) loamy fine sand, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

AC—10 to 16 inches; grayish brown (2.5Y 5/2) loamy fine sand, very dark grayish brown (2.5Y 3/2) moist; few fine faint mottles of dark brown (10YR 4/3); weak medium subangular blocky structure; soft, very friable; neutral; gradual wavy boundary.

C1—16 to 26 inches; grayish brown (2.5Y 5/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; common medium distinct mottles of strong brown (7.5YR 5/8); single grained; loose; few medium dark segregations (oxides); mildly alkaline; abrupt wavy boundary.

IIC2gca—26 to 34 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few medium dark segregations (oxides); common fine segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

IIC3g—34 to 42 inches; light gray (2.5Y 7/2) clay loam, light brownish gray (2.5Y 6/2) moist; common medium distinct mottles of dark yellowish brown (10YR 4/6); massive; hard, friable, slightly sticky and slightly plastic; few medium dark segregations (oxides); few medium segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

IIC4g—42 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; common medium distinct mottles of dark yellowish brown (10YR 4/6); massive; hard, friable, slightly sticky and slightly plastic; few medium dark segregations (oxides); strong effervescence; mildly alkaline.

The thickness of the solum ranges from 10 to 24 inches. The mollic epipedon is 10 to 16 inches thick. The depth to free carbonates and to contrasting loamy material ranges from 20 to 40 inches.

The A horizon has color value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is loamy sand or sandy loam in some pedons. The AC horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is loamy sand in some pedons. Some pedons lack an AC horizon. The C horizon has hue of 2.5Y or 10YR, value of 4 to 6 (3 or 4 moist), and chroma of 2 to 4. It is loamy sand or fine sand in some pedons. The IIC 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 in some pedons and is mildly alkaline or moderately alkaline.

Spottswood series

The Spottswood series consists of moderately well drained soils that are moderately permeable in the upper part and rapidly permeable in the lower part. These soils formed in loamy alluvium that is moderately deep over sand and gravel. They are on terraces and uplands. Slopes range from 0 to 6 percent.

Spottswood soils are near Delmont, Enet, and Grat soils. Delmont soils have sand and gravel within a depth of 20 inches. Enet soils are well drained. Grat soils are poorly drained and are fine textured.

Typical pedon of Spottswood loam 1,055 feet east and 410 feet south of the northwest corner of sec. 12, T. 110 N., R. 60 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

A12—6 to 12 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable; slightly acid; gradual smooth boundary.

B21—12 to 15 inches; dark gray (10YR 4/1) light clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to weak medium blocky; slightly hard, friable, slightly sticky and slightly plastic; neutral; gradual smooth boundary.

B22—15 to 22 inches; dark grayish brown (10YR 4/2) light clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium blocky; slightly hard, friable, slightly sticky; neutral; gradual wavy boundary.

B3ca—22 to 28 inches; grayish brown (2.5Y 5/2) light clay loam, dark grayish brown (2.5Y 4/2) moist; few fine faint mottles of dark brown (10YR 3/3); weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine dark concretions (oxides); many medium segregations of lime; violent effervescence; moderately alkaline; gradual wavy boundary.

IIC1ca—28 to 38 inches; grayish brown (2.5Y 5/2) gravelly sand, dark grayish brown (2.5Y 4/2) moist; common fine distinct mottles of dark yellowish brown (10YR 4/6); single grained; loose; few fine prominent dark concretions (oxides); common fine segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

IIC2—38 to 60 inches; dominantly grayish brown (2.5Y 5/2) sand stratified with gravel, dark grayish brown (2.5Y 4/2) moist; many coarse prominent mottles of strong brown (7.5YR 5/6); single grained; loose; strong effervescence; mildly alkaline.

The thickness of the mollic epipedon and the depth to free carbonates range from 16 to 34 inches. The depth to sand and gravel ranges from 20 to 40 inches.

The A horizon has color value of 3 or 4 (2 or 3 moist) and chroma of less than 1.5. It is fine sandy loam in some pedons and is slightly acid or neutral. It is 6 to 12 inches thick. The B2 horizon has hue of 10YR or 2.5Y, value of 3 or 4 (2 or 3 moist), and chroma of 1 or 2. It is loam in some pedons and is slightly acid or neutral. The B3ca horizon has color value of 5 to 7 (4 or 5 moist) and chroma of 2 or 3. It is loam in some pedons and is mildly alkaline or moderately alkaline. Some pedons have a Cca horizon above the IIC horizon. The IIC horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is mildly alkaline to moderately alkaline.

Stickney series

The Stickney series consists of deep, moderately well drained, slowly permeable soils formed in glacial till. These soils are on uplands. They have natric horizons. Slopes range from 0 to 3 percent.

Stickney soils are near Beadle, Dudley, and Jerauld soils. Beadle soils lack natric horizons. Dudley soils have columnar structure in the upper part of the B2t horizon and do not have tongues of A2 material in the natric horizons. Jerauld soils have visible accumulations of salts within 16 inches of the surface.

Typical pedon of Stickney silt loam, in an area of Dudley-Stickney silt loams, 0 to 3 percent slopes, 1,195 feet north and 195 feet west of the southeast corner of sec. 4, T. 110 N., R. 62 W.

A1—0 to 8 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure parting to weak fine and medium granular; soft, friable; medium acid; clear smooth boundary.

A2—8 to 11 inches; gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; weak medium platy structure parting to weak fine subangular blocky; soft, friable; slightly acid; gradual smooth boundary.

B&A—11 to 13 inches; dark gray (10YR 4/1) silty clay loam (B), very dark gray (10YR 3/1) moist; gray (10YR 6/1) tongues of silt loam

(A), dark gray (10YR 4/1) moist; weak fine prismatic structure parting to weak fine and medium subangular blocky; hard, friable, slightly sticky; slightly acid; clear smooth boundary.

B21t—13 to 22 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; dark gray (10YR 4/1) coats on faces of peds; weak fine prismatic structure parting to moderate fine and medium blocky; very hard, firm, sticky and plastic; slightly acid; gradual smooth boundary.

B22t—22 to 26 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine prismatic structure parting to moderate fine and medium blocky; very hard, firm, sticky and plastic; slightly acid; gradual wavy boundary.

B3ca—26 to 32 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; very few fine clusters of gypsum; common medium segregations of lime; strong effervescence; mildly alkaline; gradual wavy boundary.

C1cs—32 to 45 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine clusters of gypsum; few fine segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—45 to 60 inches; light brownish gray (2.5Y 6/2) and light yellowish brown (2.5Y 6/4) clay loam, grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine clusters of gypsum; few fine segregations of lime; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 44 inches. The mollic epipedon is 20 to 36 inches thick and extends into the B2t horizon.

The A1 horizon has color value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is loam in some pedons. It ranges from medium acid to mildly alkaline. It is 6 to 9 inches thick. The A2 horizon has color value of 5 or 6 (3 or 4 moist) and chroma of 1 to 3. It is loam in some pedons and is slightly acid or neutral. It is 2 to 6 inches thick. The B2t horizon has color value of 3 to 5 (2 to 4 moist) and chroma of 1 or 2. It is clay loam in some pedons and is slightly acid to mildly alkaline. The B3 horizon has color value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. It is silty clay loam in some pedons. The C horizon has color value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. The B3 and C horizons are mildly alkaline or moderately alkaline.

Talmo series

The Talmo series consists of excessively drained, rapidly permeable soils that formed in gravelly glacial outwash. These soils are on uplands and terraces. Slopes range from 2 to 6 percent.

Talmo soils are near Delmont and Enet soils. Delmont soils have sand and gravel at a depth of 10 to 20 inches. Enet soils have sand and gravel at a depth of 20 to 40 inches and have a mollic epipedon that is more than 20 inches thick.

Typical pedon of Talmo sandy loam, in an area of Delmont-Talmo complex, 2 to 6 percent slopes, 1,280 feet east and 100 feet south of the northwest corner of sec. 14, T. 110 N., R. 65 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) sandy loam, black (10YR 2/1) moist; weak fine and medium granular structure; soft, friable; neutral; abrupt smooth boundary.

IIC1ca—7 to 12 inches; light brownish gray (10YR 6/2) gravelly sand; dark grayish brown (10YR 4/2) moist; very weak medium and coarse subangular blocky structure; soft, loose; common fine and medium segregations of lime; strong effervescence; moderately alkaline; gradual wavy boundary.

IIC2—12 to 60 inches; light brownish gray (2.5Y 6/2) sand stratified with gravel, grayish brown (2.5Y 5/2) moist; single grained; loose; strong effervescence; moderately alkaline.

The depth to sand and gravel is 10 inches or less. The mollic epipedon is 7 to 10 inches thick. In cultivated areas the Ap horizon commonly is calcareous.

The A horizon has color value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is gravelly loam or loam in some pedons and is neutral or mildly alkaline. The IIC horizon has color value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is mildly alkaline or moderately alkaline.

Tetonka series

The Tetonka series consists of deep, poorly drained, very slowly permeable soils formed in alluvium. These soils are in closed depressions in uplands. Slopes are less than 1 percent.

Tetonka soils are near Dudley and Hoven soils. Dudley and Hoven soils have natric horizons.

Typical pedon of Tetonka silt loam, in an area of Tetonka-Hoven silt loams, 1,320 feet west and 250 feet north of the southeast corner of sec. 35, T. 111 N., R. 60 W.

A1—0 to 8 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak medium granular; slightly hard, friable; slightly acid; abrupt smooth boundary.

A2—8 to 14 inches; gray (10YR 5/1) silt loam, dark gray (10YR 4/1) moist; few medium faint mottles of brown (7.5YR 5/4); weak thin platy structure parting to weak fine granular; slightly hard, very friable; slightly acid; clear wavy boundary.

B&A—14 to 18 inches; dark gray (10YR 4/1) clay loam (B), very dark grayish brown (10YR 3/2) moist; gray (10YR 5/1) tongues of silt loam (A), dark gray (10YR 4/1) moist; few fine prominent mottles of strong brown (7.5YR 5/6); moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; slightly acid; clear smooth boundary.

B21t—18 to 25 inches; gray (10YR 5/1) clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; very hard, firm, sticky and plastic; neutral; gradual wavy boundary.

B22t—25 to 37 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse prismatic structure parting to moderate medium and fine subangular blocky; very hard, firm, sticky and plastic; neutral; gradual wavy boundary.

B3—37 to 42 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; many fine distinct mottles of dark yellowish brown (10YR 4/6) and olive brown (2.5Y 4/4); moderate coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, firm, sticky and plastic; few fine dark segregations (oxides); mildly alkaline; clear wavy boundary.

C—42 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; many fine and medium distinct mottles of dark yellowish brown (10YR 4/6) and olive brown (2.5Y 4/4); massive; hard, friable, slightly sticky and slightly plastic; common medium dark segregations (oxides); slight effervescence; mildly alkaline.

The thickness of the solum ranges from 28 to 74 inches, and the depth to free carbonates ranges from 36 to more than 60 inches. The mollic epipedon ranges from 24 to 50 inches in thickness.

The A1 horizon has color value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is 6 to 12 inches thick. The A2 horizon has color value of 5 to 7 (3 to 5 moist) and chroma of 1 or 2. It is 4 to 10 inches thick. Few to many distinct or prominent mottles are in the A1 or A2 horizon or in both. The A1 and A2 horizons are loam in some pedons and are neutral to medium acid. Some pedons lack a B&A or A&B horizon. 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 silty clay loam in some pedons and is slightly acid to mildly alkaline. The C horizon is silty clay, silty clay loam, clay loam, or clay. It is stratified with thin lenses of loam or sandy loam in some pedons.

Zell series

The Zell series consists of deep, well drained, moderately permeable soils formed in glaciolacustrine sediments. These soils are on uplands. Slopes range from 2 to 12 percent.

Zell soils are near Great Bend soils and are similar to Betts soils. Great Bend soils are fine-silty and are deeper to free carbonates than Zell soils. Betts soils are fine-loamy.

Typical pedon of Zell silt loam, 6 to 12 percent slopes, 530 feet west and 150 feet north of the southeast corner of sec. 23, T. 113 N., R. 62 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; moderate fine and medium granular structure; slightly hard, very friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

AC—6 to 13 inches; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; strong effervescence; moderately alkaline; gradual smooth boundary.

C1ca—13 to 18 inches; light gray (2.5Y 7/2) silt loam, light olive brown (2.5Y 5/4) moist; massive; soft, very friable; violent effervescence; moderately alkaline; gradual smooth boundary.

C2—18 to 60 inches; light gray (2.5Y 7/2) silt loam, light olive brown (2.5Y 5/4) moist; massive; soft, very friable; strong effervescence; moderately alkaline.

The solum is 8 to 16 inches thick, and the mollic epipedon is 7 to 12 inches thick. Free carbonates are at the surface or within 8 inches of the surface.

The A horizon has color value of 3 or 4 (2 or 3 moist) and chroma of less than 1.5. It is loam in some pedons and is neutral to moderately alkaline. It is 4 to 8 inches thick. The AC horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 to 5 moist), and chroma of 2 to 4. The AC and C horizons are mildly alkaline or moderately alkaline. The C horizon has color value of 6 to 8 (4 to 6 moist) and chroma of 2 to 4. In some pedons it has fine or medium segregations of lime in the upper part.

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to the latest literature available (*8*, *10*).

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 Ustoll (*Ust*, meaning burned, 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 Haplustolls (*Hapl*, meaning simple horizons, plus *ustoll*, the suborder of Mollisols that have a ustic moisture 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 Haplustolls.

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-loamy, mixed, mesic Typic Haplustolls.

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.

Formation of the soils

This section describes the factors of soil formation, relates them to the formation of soils in the survey area, and explains the processes of soil formation.

Soil forms through the physical and chemical weathering of deposited or accumulated geologic material. The characteristics of the soil at any given place are determined by (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. Parent material also affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil profile. It may be much or little, but some time is always required for the differentiation of soil horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil formation are unknown.

In the following paragraphs, the effect of the factors of soil formation on the soils of Beadle County is briefly described.

Parent material

Most of the soils in Beadle County formed in glacial material derived from preglacial formations of granite, gneiss, limestone, sandstone, and shale. This material was picked up by the glacier, was ground and mixed as it was transported, and was redeposited as the glacier melted. Some deposits are unsorted material, or glacial till; others are material that was sorted by water as it was deposited or by wind and water after it was deposited.

Glacial deposits of Late Wisconsin age averaging 35 feet in thickness over older glacial deposits are on the surface throughout most of the county (*4*). Evidence suggests that the Late Wisconsin ice margin melted four times in Beadle County during the period of deglaciation. Late Wisconsin glacial water was impounded by drift and ice, and the first deposits of glacial Late Dakota were laid down in the north-central part of the county. Lake Dakota eventually drained southward, cutting the James River trench. The Lake Wisconsin deposits consisted mainly of poorly sorted glacial till, stratified loamy glacial drift, and stratified glacial outwash.

The glacial till in the northeastern part of the county weathers to olive gray clay loam or clay, is firm, and contains fragments of shale. Beadle, Dudley, and Stickney soils formed in this till. In other parts of the county, the till is yellowish, is loam to clay loam, is friable to firm, and contains fewer fragments of shale. Betts, Ethan, Houdek, and Prosper soils formed in this till.

Stratified loamy glacial drift mantles the unsorted till throughout much of the northwestern part of the county. Bonilla and Hand soils formed in part or entirely in this stratified drift.

Glacial outwash material consists of sand, gravel, and loamy material deposited by glacial melt water. Delmont, Enet, and Talmo soils formed in loamy material underlain by sand and gravel within a depth of 40 inches. The outwash deposits occur as a thin mantle over glacial till or glacial drift in extensive areas. Carthage, Forestburg, and Shue soils formed in outwash sediments underlain by glacial till or drift within a depth of 40 inches. Blendon soils are in places where the outwash sediments are more than 40 inches thick. Doger soils are in places where outwash sand has been reworked and redeposited by wind.

Glaciolacustrine deposits extend into the county north of Lake Byron. Great Bend and Zell soils formed in these silty sediments.

Bonilla, Hoven, Prosper, and Tetonka soils are examples of soils formed partly or entirely in local alluvium washed in from adjacent sloping upland soils. Bon, Durrstein, Egas, LaDelle, and Lamo soils formed in alluvium deposited by streams.

Climate

Climate is a factor in soil formation because it directly influences the rate of chemical and physical weathering. The county has a continental climate marked by cold winters and hot summers. The average annual air temperature is about 45 degrees F. The average annual precipitation is about 19 inches, about 70 percent of which falls during the period April through September.

This climate favors a grassland ecology, which results in the accumulation of organic matter in the upper part of the soil. The precipitation is sufficient to leach carbonates in most soils to an average depth of about 20 inches. The climate is generally uniform throughout the county. Therefore, climate alone does not account for differences among soils in the county.

Plant and animal life

Plants, animals, insects, earthworms, bacteria, fungi and other living organisms are important in soil formation. In Beadle County, the tall and mid prairie grasses have had more influence on soil formation than other living organisms. Consequently, the soils have a moderate to high content of organic matter in the surface layer. Earthworms, cicada, and burrowing animals help to keep the soil open and porous. Bacteria and fungi decompose plant residue and thus provide plant food by releasing nutrients.

Relief

Relief, or lay of the land, influences soil formation through its effect on drainage, runoff, erosion, plant cover, and soil temperature. Betts and Zell soils are examples of soils that lose much rainfall because of excessive runoff. Excessive runoff decreases the amount of moisture that enters the soil and increases the amount of soil that is lost through erosion. Organic matter accumulates in thin layers, and the soils are calcareous at or near the surface. More moisture enters Beadle, Hand, and Houdek soils because runoff is not so rapid. As a result, the layers in which organic matter accumulates are thicker, and the soils are calcareous below a depth of 10 inches. Bonilla and Prosper soils are in swales that receive extra moisture as runoff from adjacent soils. The layers in which organic matter accumulates are even thicker than those of the Beadle, Hand, and Houdek soils, and the depth to carbonates is greater. In low areas where drainage is impeded and the water table is high, the fluctuating water table favors the concentration of salts in such soils as Durrstein and Egas.

Time

The length of time that soil material has been exposed to the other four factors of soil formation is reflected in the kinds of soil that form. All of the soils of Beadle County are on somewhat young landscapes that date back to the Late Wisconsin age of the glacial period. The youngest soils in the county are those on active flood plains, such as Bon, LaDelle, and Lamo soils.

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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 slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

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.

Compressible. Excessive decrease in volume of soft soil under load.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour 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.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

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 forage and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

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 lime. Excess carbonates. Excessive carbonates, or lime, restrict the growth of some plants.

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.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the assorted and unassorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by melt water as it flows from glacial ice.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes by water originating mainly from the melting of glacial ice. Many are interbedded or laminated.

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.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by water that originated mainly from the melting of glacial ice. Glacial outwash is commonly in valleys on landforms known as valley trains, outwash terraces, eskers, kame terraces, kames, outwash fans, or deltas.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Piping. Moving water forms subsurface tunnels or pipelike cavities in the soil.

Planned grazing system. A system in which two or more grazing units are alternately rested in a planned sequence over a period of years. The rest period may be throughout the year or during the growing season of the key plants.

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.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

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.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

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. 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.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

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 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* (0.005 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.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

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.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

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

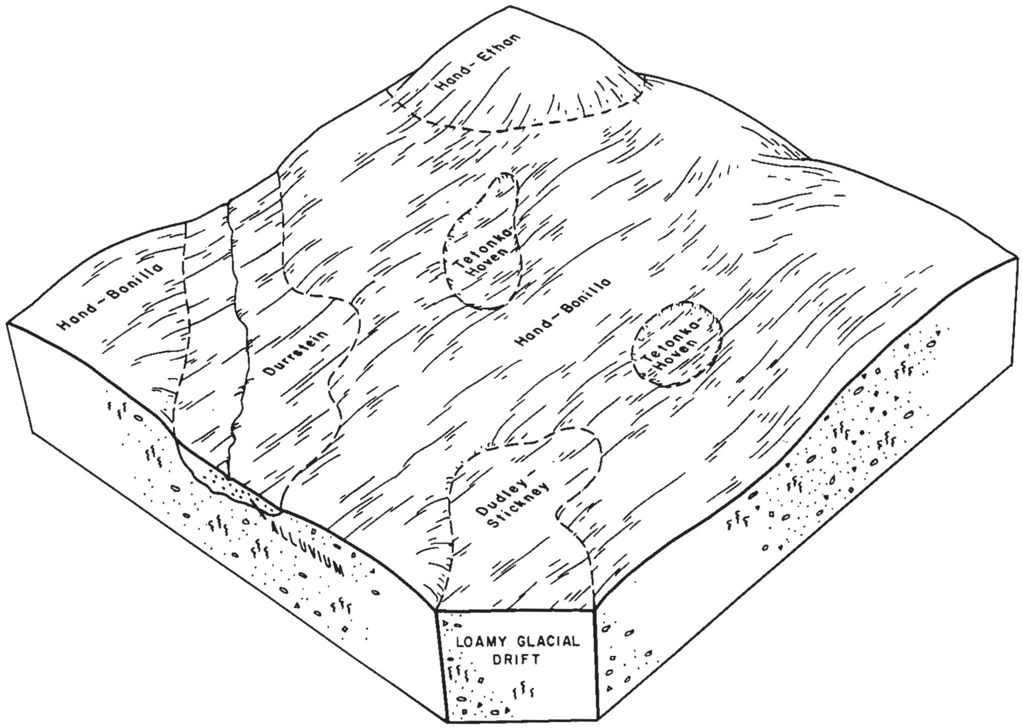

Figure 1.—Pattern of soils and underlying material in the Hand-Bonilla map unit.

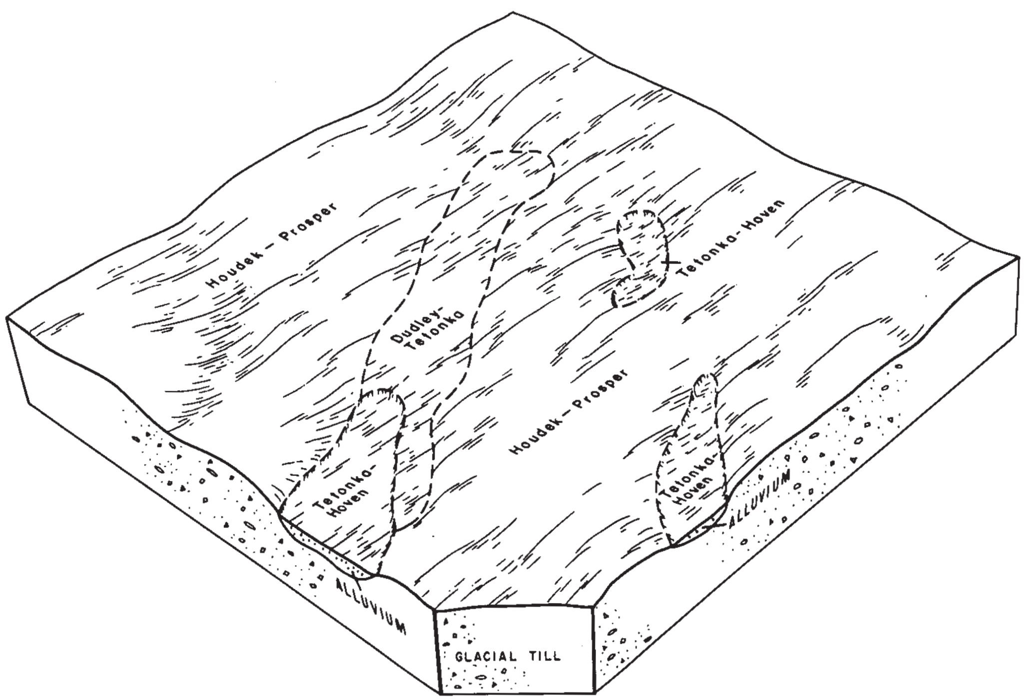

Figure 2.—Pattern of soils and underlying material in the Houdek-Prosper map unit.

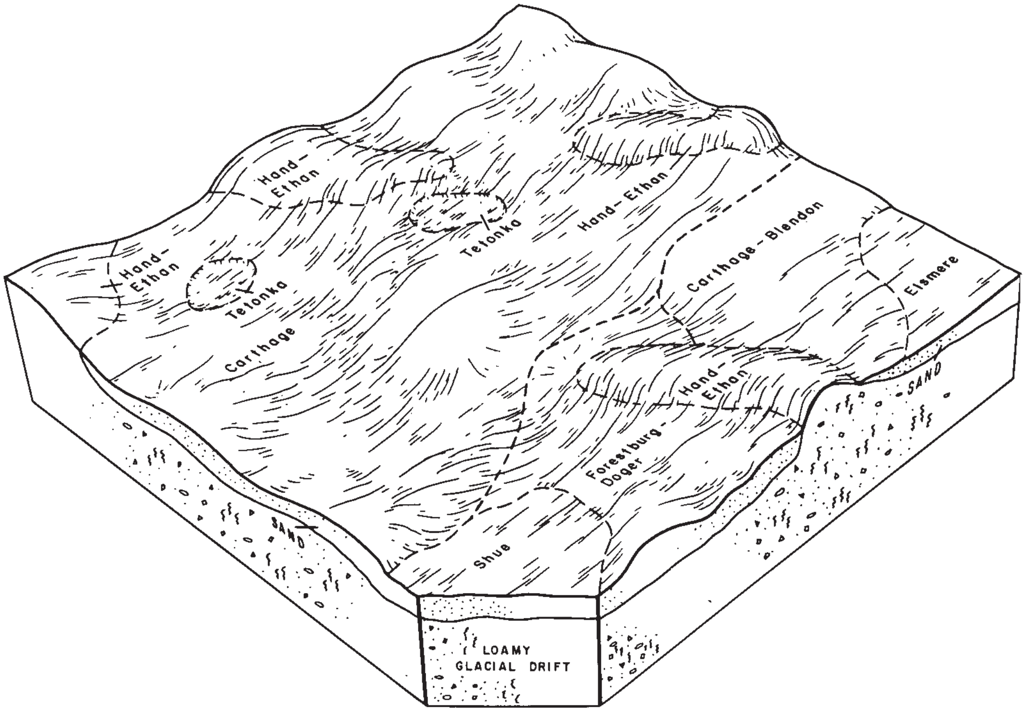

Figure 3.—Pattern of soils and underlying material in the Carthage-Hand map unit.

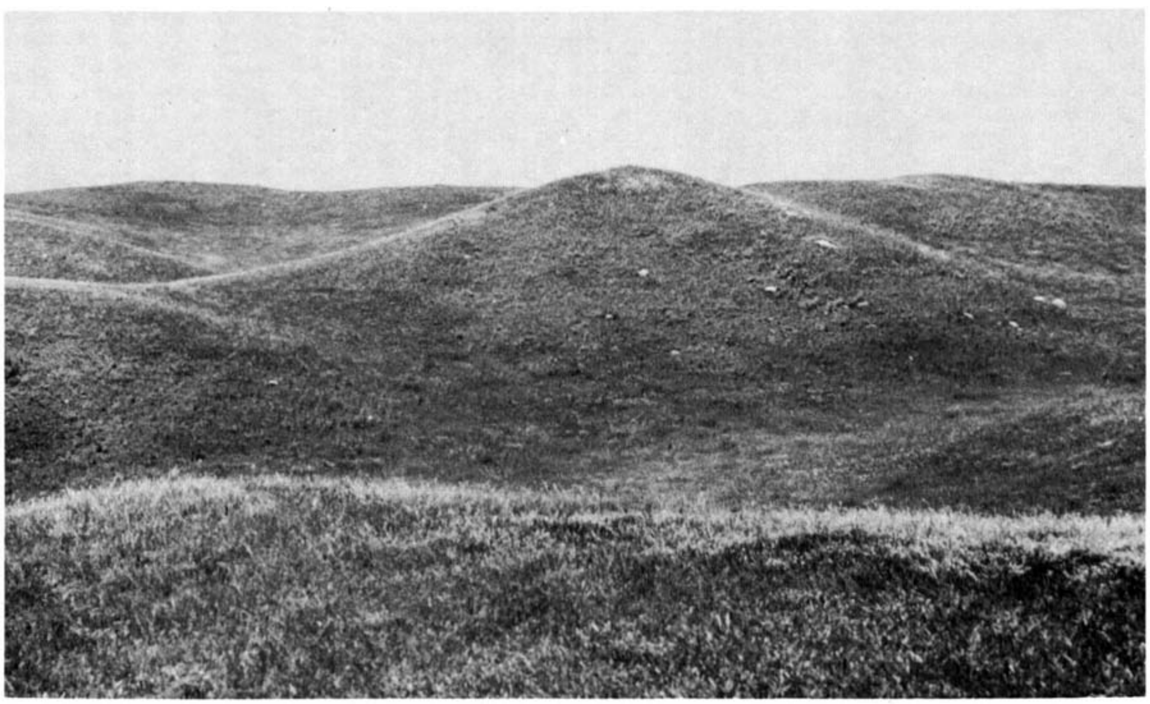

Figure 4.—Short, convex slopes in an area of Betts-Ethan loams, 9 to 21 percent slopes.

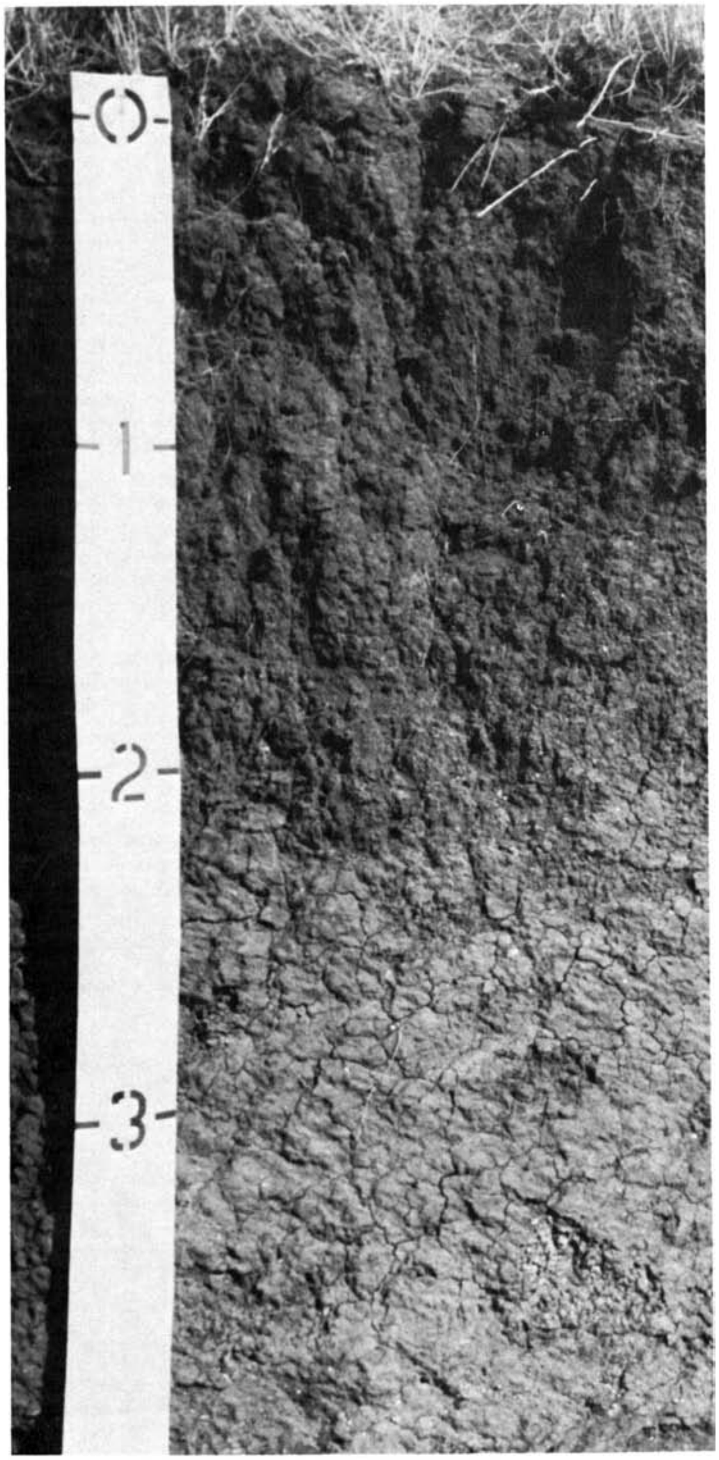

Figure 5.—Profile of Bon silt loam. Layers are indistinct.

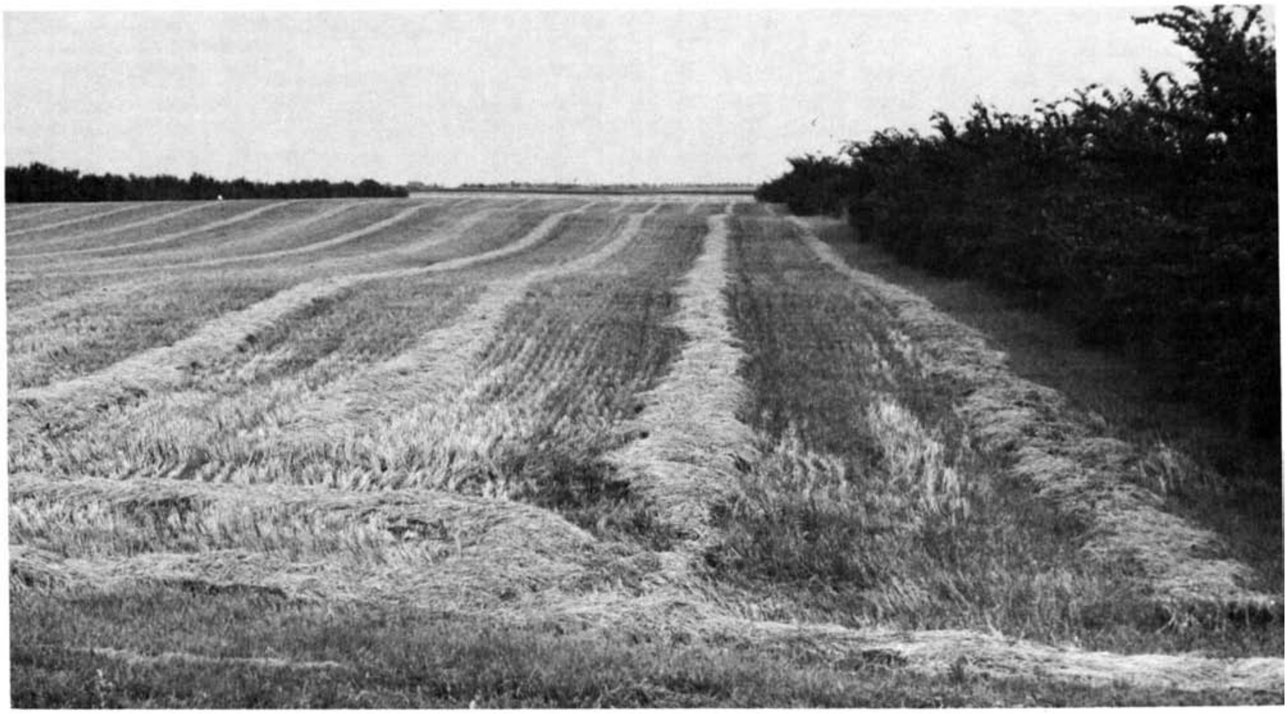

Figure 6.—Field windbreaks on Carthage-Blendon fine sandy loams, 2 to 6 percent slopes.

Figure 7.—An area of Grat loam in native pasture.

Figure 8.—Area of range on Hand-Ethan loams, 6 to 9 percent slopes. The range site is Silty.

Figure 9.—Area of range on Houdek-Ethan loams, 6 to 9 percent slopes. The range site is Silty.

Figure 10.—Wind stripcropping on Houdek-Prosper loams, 0 to 2 percent slopes.

Figure 11.—Alfalfa field in an area of Lamo silt loam along the James River.

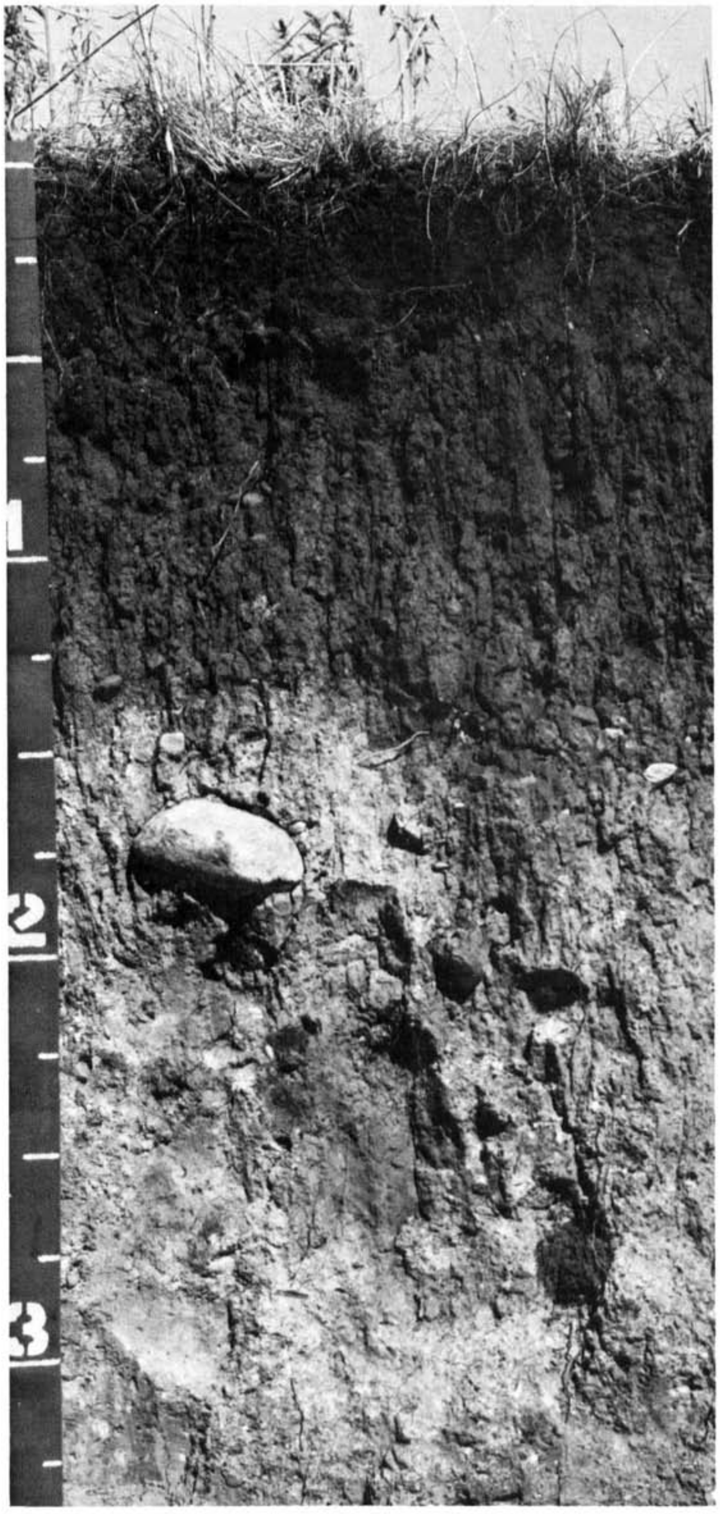

Figure 12.—Profile of Beadle loam, 0 to 2 percent slopes. The subsoil has prismatic structure.

Figure 13.—Profile of Delmont loam, 0 to 2 percent slopes. Gravelly sand is at a depth of about 16 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----	22.4	1.0	11.7	51	-31	0	0.35	0.16	0.50	1	5.8
February---	28.9	7.9	18.4	57	-27	13	.81	.25	1.24	2	10.4
March------	39.4	19.2	29.3	74	-11	92	1.01	.34	1.54	3	8.4
April------	57.7	33.3	45.5	88	13	204	1.96	.87	2.84	5	2.5
May--------	69.7	44.2	57.0	92	24	527	2.92	1.32	4.21	5	.2
June-------	79.9	55.1	67.5	101	37	825	3.44	1.80	4.78	6	.0
July-------	87.0	60.4	73.7	104	44	1,045	2.32	1.06	3.33	5	.0
August-----	85.7	58.5	72.2	104	41	998	1.99	.89	2.87	4	.0
September--	74.1	46.8	60.5	100	27	615	1.44	.56	2.15	3	.0
October----	62.7	36.1	49.4	89	16	315	1.45	.36	2.31	3	.8
November---	43.4	21.4	32.5	72	-5	33	.76	.19	1.21	2	4.5
December---	28.7	8.9	18.8	59	-23	15	.60	.17	.94	2	7.6
Year-----	56.6	32.7	44.7	107	-31	4,682	19.05	14.60	23.22	41	40.2

[1]Recorded in the period 1951-74 at Huron, 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 10	May 19	May 29
2 years in 10 later than--	May 4	May 13	May 23
5 years in 10 later than--	April 21	May 1	May 13
First freezing temperature in fall:			
1 year in 10 earlier than--	October 4	September 26	September 15
2 years in 10 earlier than--	October 9	October 1	September 20
5 years in 10 earlier than--	October 18	October 11	September 30

[1]Recorded in the period 1951-74 at Huron, 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	163	139	116
8 years in 10	169	147	124
5 years in 10	179	161	139
2 years in 10	190	176	154
1 year in 10	195	184	162

[1]Recorded in the period 1951-74 at Huron, S. Dak.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ao	Aquolls	6,520	0.8
BaA	Beadle loam, 0 to 2 percent slopes	47,265	5.9
BaB	Beadle loam, 2 to 6 percent slopes	30,715	3.8
BaC	Beadle loam, 6 to 9 percent slopes	3,015	0.4
BdA	Beadle-Dudley complex, 0 to 2 percent slopes	21,905	2.7
BeD	Betts stony loam, 6 to 40 percent slopes	7,905	1.0
BfD	Betts-Ethan loams, 9 to 21 percent slopes	10,390	1.3
BnA	Blendon fine sandy loam, 0 to 2 percent slopes	2,100	0.3
Bo	Bon silt loam	1,390	0.2
Bx	Bon silt loam, channeled	8,750	1.1
CaA	Carthage fine sandy loam, 0 to 2 percent slopes	9,265	1.1
CaB	Carthage fine sandy loam, 2 to 6 percent slopes	18,440	2.3
CaC	Carthage fine sandy loam, 6 to 9 percent slopes	1,535	0.2
CbA	Carthage-Blendon fine sandy loams, 0 to 2 percent slopes	12,995	1.6
CbB	Carthage-Blendon fine sandy loams, 2 to 6 percent slopes	2,600	0.3
DaB	Davis loam, 2 to 9 percent slopes	3,055	0.4
DeA	Delmont loam, 0 to 2 percent slopes	5,800	0.7
DfB	Delmont-Talmo complex, 2 to 6 percent slopes	3,660	0.5
Dg	Doger loamy fine sand	1,740	0.2
DkA	Dudley-Jerauld silt loams, 0 to 3 percent slopes	7,125	0.9
DsA	Dudley-Stickney silt loams, 0 to 3 percent slopes	37,685	4.7
DtA	Dudley-Tetonka silt loams	49,085	6.1
Du	Durrstein silt loam	17,530	2.2
Eg	Egas silty clay loam	12,760	1.6
Em	Elsmere loamy fine sand, loamy substratum	3,200	0.4
EnA	Enet loam, 0 to 2 percent slopes	13,370	1.7
EnB	Enet loam, 2 to 6 percent slopes	1,035	0.1
FoA	Forestburg loamy fine sand, 0 to 3 percent slopes	1,780	0.2
FoB	Forestburg loamy fine sand, 3 to 6 percent slopes	1,445	0.2
FrA	Forestburg-Doger loamy fine sands, 0 to 3 percent slopes	4,105	0.5
FrB	Forestburg-Doger loamy fine sands, 3 to 6 percent slopes	1,040	0.1
Ga	Grat loam	4,520	0.6
GbA	Great Bend silt loam, 0 to 2 percent slopes	3,070	0.4
GzB	Great Bend-Zell silt loams, 2 to 6 percent slopes	1,630	0.2
HaA	Hand-Bonilla loams, 0 to 3 percent slopes	15,075	1.9
HaB	Hand-Bonilla loams, 3 to 6 percent slopes	86,215	10.7
HbC	Hand-Ethan loams, 6 to 9 percent slopes	8,610	1.0
HcB	Houdek stony loam, 0 to 9 percent slopes	3,235	0.4
HdB	Houdek-Dudley complex, 3 to 6 percent slopes	5,660	0.7
HeB	Houdek-Ethan loams, 2 to 6 percent slopes	1,150	0.1
HeC	Houdek-Ethan loams, 6 to 9 percent slopes	12,875	1.6
HoA	Houdek-Prosper loams, 0 to 2 percent slopes	87,550	10.9
HoB	Houdek-Prosper loams, 2 to 6 percent slopes	148,640	18.4
Hv	Hoven silt loam	9,595	1.2
La	LaDelle silt loam	3,670	0.5
Lm	Lamo silt loam	5,575	0.7
LnA	Lane silt loam, 0 to 2 percent slopes	8,535	1.0
Lo	Loup loamy fine sand	985	0.1
Mo	Mobridge silt loam	945	0.1
OkB	Oko clay loam, 3 to 9 percent slopes	770	0.1
OkD	Oko clay loam, 9 to 21 percent slopes	495	<0.1
Pg	Pits, gravel	1,010	0.1
PrA	Prosper-Davison loams, 0 to 3 percent slopes	1,775	0.2
Sh	Shue loamy fine sand	6,165	0.8
Sp	Spottswood loam	4,990	0.6
St	Stickney-Jerauld silt loams	2,180	0.3
Ta	Tetonka loamy fine sand, overblown	1,110	0.1
Te	Tetonka-Hoven silt loams	28,180	3.5
ZeC	Zell silt loam, 6 to 12 percent slopes	900	0.1
	Sewage lagoon	449	<0.1
	Open water(<40 acres in size)	1,700	0.2
	Total land area	806,464	100.0
	Open water(>40 acres in size)	3,136	
	Total area	809,600	

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[All yields were estimated for a high level of management in 1976. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Soil name and map symbol	Corn	Oats	Grain sorghum	Alfalfa hay	Bromegrass-alfalfa	Spring wheat
	Bu	Bu	Bu	Ton	AUM[1]	Bu
Beadle:						
BaA	54	57	54	2.8	4.7	31
BaB	50	55	52	2.8	4.7	29
BaC	41	46	42	2.6	4.3	26
[2]BdA	44	48	45	2.3	3.8	27
Betts:						
BeD	---	---	---	---	---	---
[2]BfD	---	---	---	---	---	---
Blendon:						
BnA	55	50	45	2.0	3.3	25
Bon:						
Bo	63	75	70	3.3	5.5	36
Bx	---	---	---	2.8	4.7	---
Carthage:						
CaA	62	51	47	2.8	4.4	25
CaB	57	48	44	2.6	4.1	22
CaC	46	38	38	2.2	3.5	15
[2]CbA	60	51	46	2.6	4.2	25
[2]CbB	56	48	43	2.4	3.9	22
Davis:						
DaB	60	72	63	2.9	4.5	32
Delmont:						
DeA	24	32	22	1.2	2.0	---
[2]DfB	18	26	19	0.8	1.3	---
Doger:						
Dg	38	36	32	1.8	3.0	---
Dudley:						
[2]DkA	20	26	22	1.0	1.8	15
[2]DsA	35	38	35	1.7	2.9	24
[2]DtA	25	28	27	1.2	2.0	16
Durrstein:						
Du	---	---	---	---	---	---
Egas:						
Eg	---	---	---	---	---	---
Elsmere:						
Em	60	49	50	3.0	4.8	---
Enet:						
EnA	45	49	39	2.2	3.7	25
EnB	40	44	37	2.1	3.5	22

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Grain sorghum	Alfalfa hay	Bromegrass-alfalfa	Spring wheat
	Bu	Bu	Bu	Ton	AUM[1]	Bu
Forestburg:						
FoA	58	46	45	2.6	4.3	18
FoB	53	43	44	2.4	4.0	15
[2]FrA	47	41	40	2.3	3.7	---
[2]FrB	45	39	38	2.2	3.5	---
Grat:						
Ga	40	50	---	3.5	5.6	---
Great Bend:						
GbA	57	67	56	2.5	4.2	29
[2]GzB	48	56	45	2.1	3.5	24
Hand:						
[2]HaA	62	68	59	2.6	4.3	30
[2]HaB	57	65	55	2.5	4.2	28
[2]HbC	41	53	40	2.2	3.6	22
Houdek:						
HcB	---	---	---	---	---	---
[2]HdB	45	51	45	2.0	3.4	23
[2]HeB	53	59	49	2.4	4.0	26
[2]HeC	48	53	42	2.3	3.7	22
[2]HoA	62	69	60	2.8	4.5	32
[2]HoB	57	66	56	2.6	4.4	30
Hoven:						
Hv	---	---	---	---	---	---
LaDelle:						
La	67	73	65	3.2	5.5	33
Lamo:						
Lm	65	72	65	3.1	5.3	29
Lane:						
LnA	53	70	54	2.8	4.7	28
Loup:						
Lo	30	25	28	3.2	5.2	---
Mobridge:						
Mo	66	72	65	3.2	5.2	33
Oko:						
OkB	29	43	35	1.7	2.8	19
OkD	---	---	---	---	---	---
Pits:						
Pg.						
Prosper:						
[2]PrA	63	67	60	2.8	4.8	30
Shue:						
Sh	58	50	55	3.0	4.5	15

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Grain sorghum	Alfalfa hay	Bromegrass-alfalfa	Spring wheat
	Bu	Bu	Bu	Ton	AUM[1]	Bu
Spottswood:						
Sp	47	51	43	2.2	3.0	24
Stickney:						
[2]St	41	44	41	1.8	2.9	25
Tetonka:						
Ta	48	30	48	2.8	4.6	---
[2]Te	---	---	---	---	---	---
Zell:						
ZeC	32	33	---	1.4	2.2	13

[1]Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for a period of 30 days.

[2]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole 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
Beadle:					
BaA	Clayey	Favorable	3,480	Western wheatgrass	35
		Normal	2,900	Green needlegrass	30
		Unfavorable	2,030	Sideoats grama	10
				Little bluestem	5
				Big bluestem	5
				Blue grama	5
				Sedge	5
BaB, BaC	Clayey	Favorable	3,240	Western wheatgrass	30
		Normal	2,700	Green needlegrass	30
		Unfavorable	1,890	Sideoats grama	10
				Blue grama	10
				Little bluestem	5
				Big bluestem	5
				Sedge	5
[1]BdA:					
Beadle part	Clayey	Favorable	3,480	Western wheatgrass	35
		Normal	2,900	Green needlegrass	30
		Unfavorable	2,030	Sideoats grama	10
				Little bluestem	5
				Big bluestem	5
				Blue grama	5
				Sedge	5
Dudley part	Claypan	Favorable	2,760	Western wheatgrass	50
		Normal	2,300	Blue grama	15
		Unfavorable	1,610	Green needlegrass	10
				Sedge	10
				Buffalograss	5
Betts:					
BeD	Thin Upland	Favorable	2,760	Little bluestem	40
		Normal	2,300	Sideoats grama	15
		Unfavorable	1,610	Needleandthread	10
				Western wheatgrass	10
				Prairie dropseed	10
				Sedge	5
				Leadplant	5
[1]BfD:					
Betts part	Thin Upland	Favorable	2,760	Little bluestem	40
		Normal	2,300	Sideoats grama	15
		Unfavorable	1,610	Needleandthread	10
				Western wheatgrass	10
				Prairie dropseed	10
				Sedge	5
				Leadplant	5
Ethan part	Silty	Favorable	2,880	Western wheatgrass	30
		Normal	2,400	Green needlegrass	20
		Unfavorable	1,680	Little bluestem	10
				Needleandthread	10
				Sideoats grama	10
				Big bluestem	5
				Blue grama	5
				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
Blendon:					
BnA	Sandy	Favorable	3,480	Little bluestem	35
		Normal	2,900	Prairie sandreed	15
		Unfavorable	2,030	Big bluestem	10
				Needleandthread	10
				Blue grama	10
				Porcupinegrass	5
				Leadplant	5
				Sedge	5
Bon:					
Bo, Bx	Overflow	Favorable	4,730	Big bluestem	55
		Normal	4,300	Western wheatgrass	15
		Unfavorable	3,010	Green needlegrass	10
				Sideoats grama	5
				Leadplant	5
				Sedge	5
Carthage:					
CaA, CaB, CaC	Sandy	Favorable	3,480	Little bluestem	35
		Normal	2,900	Prairie sandreed	15
		Unfavorable	2,030	Big bluestem	10
				Needleandthread	10
				Blue grama	10
				Porcupinegrass	5
				Leadplant	5
				Sedge	5
[1]CbA, [1]CbB:					
Carthage part	Sandy	Favorable	3,480	Little bluestem	35
		Normal	2,900	Prairie sandreed	15
		Unfavorable	2,030	Big bluestem	10
				Needleandthread	10
				Blue grama	10
				Porcupinegrass	5
				Leadplant	5
				Sedge	5
Blendon part	Sandy	Favorable	3,480	Little bluestem	35
		Normal	2,900	Prairie sandreed	15
		Unfavorable	2,030	Big bluestem	10
				Needleandthread	10
				Blue grama	10
				Porcupinegrass	5
				Leadplant	5
				Sedge	5
Davis:					
DaB	Silty	Favorable	3,840	Big bluestem	20
		Normal	3,200	Green needlegrass	20
		Unfavorable	2,240	Western wheatgrass	15
				Needleandthread	15
				Little bluestem	10
				Sideoats grama	5
				Leadplant	5
				Sedge	5
Delmont:					
DeA	Shallow To Gravel	Favorable	2,520	Needleandthread	60
		Normal	2,100	Sedge	10
		Unfavorable	1,260	Sideoats grama	5
				Prairie dropseed	5
				Blue grama	5
				Plains muhly	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
Delmont:					
[1]DfB:					
Delmont part	Shallow To Gravel	Favorable	2,520	Needleandthread	60
		Normal	2,100	Sedge	10
		Unfavorable	1,260	Sideoats grama	5
				Prairie dropseed	5
				Blue grama	5
				Plains muhly	5
Talmo part	Very Shallow	Favorable	2,040	Blue grama	40
		Normal	1,700	Needleandthread	25
		Unfavorable	1,020	Sideoats grama	10
				Sedge	10
				Plains muhly	5
Doger:					
Dg	Sandy	Favorable	3,120	Little bluestem	20
		Normal	2,600	Prairie sandreed	20
		Unfavorable	1,820	Needleandthread	10
				Sideoats grama	10
				Blue grama	10
				Big bluestem	10
				Switchgrass	10
				Western wheatgrass	5
Dudley:					
[1]DkA:					
Dudley part	Claypan	Favorable	2,760	Western wheatgrass	50
		Normal	2,300	Blue grama	15
		Unfavorable	1,610	Green needlegrass	10
				Sedge	10
				Buffalograss	5
Jerauld part	Thin Claypan	Favorable	1,920	Blue grama	30
		Normal	1,600	Western wheatgrass	25
		Unfavorable	960	Needleandthread	15
				Buffalograss	10
				Sedge	10
[1]DsA:					
Dudley part	Claypan	Favorable	2,760	Western wheatgrass	50
		Normal	2,300	Blue grama	15
		Unfavorable	1,610	Green needlegrass	10
				Sedge	10
				Buffalograss	5
Stickney part	Clayey	Favorable	3,640	Western wheatgrass	35
		Normal	2,800	Green needlegrass	30
		Unfavorable	1,960	Sideoats grama	10
				Little bluestem	5
				Big bluestem	5
				Blue grama	5
				Sedge	5
[1]DtA:					
Dudley part	Claypan	Favorable	3,240	Western wheatgrass	40
		Normal	2,700	Blue grama	15
		Unfavorable	2,190	Green needlegrass	10
				Sedge	10
				Switchgrass	5
				Big bluestem	5
				Inland saltgrass	5
Tetonka part	Closed Depression	Favorable	6,160	Prairie cordgrass	50
		Normal	5,600	Western wheatgrass	35
		Unfavorable	3,920	Sedge	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
Durrstein:					
Du	Saline Lowland	Favorable	4,950	Cordgrass	50
		Normal	4,500	Nuttall alkaligrass	20
		Unfavorable	3,600	Western wheatgrass	10
				Inland saltgrass	10
Egas:					
Eg	Saline Lowland	Favorable	4,950	Cordgrass	50
		Normal	4,500	Nuttall alkaligrass	20
		Unfavorable	3,600	Western wheatgrass	10
				Inland saltgrass	10
Elsmere:					
Em	Subirrigated	Favorable	5,280	Big bluestem	55
		Normal	4,800	Indiangrass	15
		Unfavorable	3,840	Switchgrass	10
				Sedge	10
				Western wheatgrass	5
Enet:					
EnA, EnB	Silty	Favorable	3,600	Western wheatgrass	35
		Normal	3,000	Green needlegrass	20
		Unfavorable	2,100	Big bluestem	10
				Needleandthread	10
				Little bluestem	5
				Sideoats grama	5
				Blue grama	5
				Sedge	5
Forestburg:					
FoA, FoB	Sandy	Favorable	3,240	Little bluestem	35
		Normal	2,700	Prairie sandreed	15
		Unfavorable	1,890	Big bluestem	10
				Needleandthread	10
				Blue grama	10
				Porcupinegrass	5
				Leadplant	5
				Sedge	5
[1]FrA:					
Forestburg part	Sandy	Favorable	3,240	Little bluestem	35
		Normal	2,700	Prairie sandreed	15
		Unfavorable	1,890	Big bluestem	10
				Needleandthread	10
				Blue grama	10
				Porcupinegrass	5
				Leadplant	5
				Sedge	5
Doger part	Sandy	Favorable	3,120	Little bluestem	20
		Normal	2,600	Prairie sandreed	20
		Unfavorable	1,820	Needleandthread	10
				Sideoats grama	10
				Blue grama	10
				Big bluestem	10
				Switchgrass	10
				Western wheatgrass	5
[1]FrB:					
Forestburg part	Sandy	Favorable	3,240	Little bluestem	35
		Normal	2,700	Prairie sandreed	15
		Unfavorable	1,890	Big bluestem	10
				Needleandthread	10
				Blue grama	10
				Porcupinegrass	5
				Leadplant	5
				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
Forestburg:					
[1]FrB:					
Doger part	Sandy	Favorable	2,880	Little bluestem	25
		Normal	2,400	Prairie sandreed	25
		Unfavorable	1,680	Needleandthread	10
				Sideoats grama	10
				Blue grama	10
				Western wheatgrass	5
				Big bluestem	5
				Switchgrass	5
Grat:					
Ga	Subirrigated	Favorable	5,500	Big bluestem	60
		Normal	5,000	Indiangrass	10
		Unfavorable	4,000	Switchgrass	10
				Sedge	10
				Western wheatgrass	5
Great Bend:					
GbA	Silty	Favorable	3,360	Western wheatgrass	35
		Normal	2,800	Green needlegrass	20
		Unfavorable	1,960	Big bluestem	10
				Needleandthread	10
				Little bluestem	5
				Sideoats grama	5
				Blue grama	5
				Sedge	5
[1]GzB:					
Great Bend part	Silty	Favorable	3,120	Western wheatgrass	30
		Normal	2,600	Green needlegrass	20
		Unfavorable	1,820	Little bluestem	10
				Needleandthread	10
				Sideoats grama	10
				Big bluestem	5
				Blue grama	5
				Sedge	5
Zell part	Thin Upland	Favorable	2,880	Little bluestem	20
		Normal	2,400	Western wheatgrass	20
		Unfavorable	1,680	Sideoats grama	15
				Needleandthread	10
				Blue grama	10
				Big bluestem	5
				Prairie dropseed	5
				Sedge	5
Hand:					
[1]HaA:					
Hand part	Silty	Favorable	3,480	Western wheatgrass	35
		Normal	2,900	Green needlegrass	20
		Unfavorable	2,030	Big bluestem	10
				Needleandthread	10
				Little bluestem	5
				Sideoats grama	5
				Blue grama	5
				Sedge	5
Bonilla part	Overflow	Favorable	4,400	Big bluestem	55
		Normal	4,000	Western wheatgrass	15
		Unfavorable	2,800	Green needlegrass	10
				Sideoats grama	5
				Leadplant	5
				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
Hand:					
[1]HaB:					
Hand part	Silty	Favorable	3,240	Western wheatgrass	30
		Normal	2,700	Green needlegrass	20
		Unfavorable	1,890	Little bluestem	10
				Needleandthread	10
				Sideoats grama	10
				Big bluestem	5
				Blue grama	5
				Sedge	5
Bonilla part	Silty	Favorable	3,840	Big bluestem	20
		Normal	3,200	Green needlegrass	20
		Unfavorable	2,240	Western wheatgrass	15
				Needleandthread	15
				Little bluestem	10
				Sideoats grama	5
				Leadplant	5
				Sedge	5
[1]HbC:					
Hand part	Silty	Favorable	3,240	Western wheatgrass	30
		Normal	2,700	Green needlegrass	20
		Unfavorable	1,890	Little bluestem	10
				Needleandthread	10
				Sideoats grama	10
				Big bluestem	5
				Blue grama	5
				Sedge	5
Ethan part	Silty	Favorable	3,120	Western wheatgrass	35
		Normal	2,600	Green needlegrass	20
		Unfavorable	1,820	Big bluestem	10
				Needleandthread	10
				Little bluestem	5
				Sideoats grama	5
				Blue grama	5
				Sedge	5
Houdek:					
HcB	Silty	Favorable	3,240	Western wheatgrass	30
		Normal	2,700	Green needlegrass	20
		Unfavorable	1,890	Little bluestem	10
				Needleandthread	10
				Sideoats grama	10
				Big bluestem	5
				Blue grama	5
				Sedge	5
[1]HdB:					
Houdek part	Silty	Favorable	3,240	Western wheatgrass	30
		Normal	2,700	Green needlegrass	20
		Unfavorable	1,890	Little bluestem	10
				Needleandthread	10
				Sideoats grama	10
				Big bluestem	5
				Blue grama	5
				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
Houdek:					
[1]HdB:					
Dudley part	Claypan	Favorable	2,760	Western wheatgrass	50
		Normal	2,300	Blue grama	15
		Unfavorable	1,610	Green needlegrass	10
				Sedge	10
				Buffalograss	5
[1]HeB, [1]HeC:					
Houdek part	Silty	Favorable	3,240	Western wheatgrass	30
		Normal	2,700	Green needlegrass	20
		Unfavorable	1,890	Little bluestem	10
				Needleandthread	10
				Sideoats grama	10
				Big bluestem	5
				Blue grama	5
				Sedge	5
Ethan part	Silty	Favorable	3,120	Western wheatgrass	35
		Normal	2,600	Green needlegrass	20
		Unfavorable	1,820	Big bluestem	10
				Needleandthread	10
				Little bluestem	5
				Sideoats grama	5
				Blue grama	5
				Sedge	5
[1]HoA:					
Houdek part	Silty	Favorable	3,480	Western wheatgrass	35
		Normal	2,900	Green needlegrass	20
		Unfavorable	2,030	Big bluestem	10
				Needleandthread	10
				Little bluestem	5
				Sideoats grama	5
				Blue grama	5
				Sedge	5
Prosper part	Overflow	Favorable	4,730	Big bluestem	55
		Normal	4,300	Western wheatgrass	15
		Unfavorable	3,010	Green needlegrass	10
				Sideoats grama	5
				Leadplant	5
				Sedge	5
[1]HoB:					
Houdek part	Silty	Favorable	3,240	Western wheatgrass	30
		Normal	2,700	Green needlegrass	20
		Unfavorable	1,890	Little bluestem	10
				Needleandthread	10
				Sideoats grama	10
				Big bluestem	5
				Blue grama	5
				Sedge	5
Prosper part	Silty	Favorable	3,600	Big bluestem	20
		Normal	3,000	Green needlegrass	20
		Unfavorable	2,100	Western wheatgrass	15
				Needleandthread	15
				Little bluestem	10
				Sideoats grama	5
				Leadplant	5
				Sedge	5
Hoven:					
Hv	Closed Depression	Favorable	4,620	Western wheatgrass	85
		Normal	4,000	Sedge	10
		Unfavorable	2,940		

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
LaDelle:					
La	Overflow	Favorable	4,800	Big bluestem	50
		Normal	4,000	Green needlegrass	20
		Unfavorable	2,800	Western wheatgrass	15
				Leadplant	5
				Sedge	5
Lamo:					
Lm	Subirrigated	Favorable	6,050	Big bluestem	30
		Normal	5,500	Little bluestem	10
		Unfavorable	4,400	Indiangrass	10
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	10
				Canada wildrye	5
				Kentucky bluegrass	5
Lane:					
LnA	Clayey	Favorable	3,600	Western wheatgrass	40
		Normal	3,000	Green needlegrass	30
		Unfavorable	2,100	Big bluestem	10
				Sideoats grama	5
				Blue grama	5
				Sedge	5
Loup:					
Lo	Subirrigated	Favorable	6,000	Big bluestem	30
		Normal	5,000	Indiangrass	15
		Unfavorable	3,500	Prairie cordgrass	15
				Switchgrass	10
				Little bluestem	7
				Sedge	7
				Kentucky bluegrass	5
Mobridge:					
Mo	Overflow	Favorable	4,950	Big bluestem	45
		Normal	4,500	Western wheatgrass	20
		Unfavorable	3,150	Green needlegrass	15
				Sideoats grama	5
				Leadplant	5
				Sedge	5
Oko:					
OkB	Clayey	Favorable	3,240	Western wheatgrass	35
		Normal	2,700	Green needlegrass	30
		Unfavorable	1,890	Little bluestem	10
				Sideoats grama	10
				Blue grama	5
				Sedge	5
OkD	Clayey	Favorable	3,000	Green needlegrass	25
		Normal	2,500	Western wheatgrass	20
		Unfavorable	1,750	Sideoats grama	20
				Little bluestem	15
				Blue grama	5
				Sedge	5
Prosper:					
[1]PrA:					
Prosper part	Overflow	Favorable	4,730	Big bluestem	55
		Normal	4,300	Western wheatgrass	15
		Unfavorable	3,010	Green needlegrass	10
				Sideoats grama	5
				Leadplant	5
				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
Prosper:					
[1]PrA:					
Davison part	Silty	Favorable	3,600	Western wheatgrass	35
		Normal	3,000	Green needlegrass	20
		Unfavorable	2,100	Big bluestem	10
				Needleandthread	10
				Little bluestem	5
				Sideoats grama	5
				Blue grama	5
				Sedge	5
Shue:					
Sh	Subirrigated	Favorable	5,280	Big bluestem	55
		Normal	4,800	Indiangrass	15
		Unfavorable	3,840	Switchgrass	10
				Sedge	10
				Western wheatgrass	5
Spottswood:					
Sp	Overflow	Favorable	4,510	Big bluestem	55
		Normal	4,100	Western wheatgrass	20
		Unfavorable	2,870	Green needlegrass	10
				Leadplant	5
				Sedge	5
Stickney:					
[1]St:					
Stickney part	Clayey	Favorable	3,640	Western wheatgrass	35
		Normal	2,800	Green needlegrass	30
		Unfavorable	1,960	Sideoats grama	10
				Little bluestem	5
				Big bluestem	5
				Blue grama	5
				Sedge	5
Jerauld part	Thin Claypan	Favorable	1,920	Blue grama	30
		Normal	1,600	Western wheatgrass	25
		Unfavorable	960	Needleandthread	15
				Buffalograss	10
				Sedge	10
Tetonka:					
Ta	Closed Depression	Favorable	6,000	Prairie cordgrass	50
		Normal	5,000	Western wheatgrass	35
		Unfavorable	3,500	Sedge	10
[1]Te:					
Tetonka part	Closed Depression	Favorable	6,160	Prairie cordgrass	50
		Normal	5,600	Western wheatgrass	35
		Unfavorable	3,920	Sedge	10
Hoven part	Closed Depression	Favorable	4,620	Western wheatgrass	85
		Normal	4,000	Sedge	10
		Unfavorable	2,940		
Zell:					
ZeC	Thin Upland	Favorable	2,880	Little bluestem	20
		Normal	2,400	Western wheatgrass	20
		Unfavorable	1,680	Sideoats grama	15
				Needleandthread	10
				Blue grama	10
				Big bluestem	5
				Prairie dropseed	5
				Sedge	5

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole 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	>35
Beadle:					
BaA, BaB, BaC	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Russian-olive, eastern redcedar.	---	---
[1]BdA:					
Beadle part	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Russian-olive, eastern redcedar.	---	---
Dudley part	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---
Betts:					
BeD.					
[1]BfD:					
Betts part.					
Ethan part.					
Blendon:					
BnA	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.	---	---
Bon:					
Bo, Bx	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
Carthage:					
CaA, CaB, CaC	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.	---	---
[1]CbA:					
Carthage part	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, 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	>35
Carthage:					
Blendon part---	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.	---	---
[1]CbB:					
Carthage part--	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.	---	---
Blendon part---	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.	---	---
Davis:					
DaB---------------	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
Delmont:					
DeA.					
[1]DfB:					
Delmont part.					
Talmo part.					
Doger:					
Dg----------------	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.	---	---
Dudley:					
[1]DkA:					
Dudley part----	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---
Jerauld part.					
[1]DsA:					
Dudley part----	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---
Stickney part--	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Russian-olive, eastern redcedar.	---	---

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	>35
Dudley:					
[1]DtA:					
Dudley part	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, ponderosa pine, green ash, Russian-olive.	---	---	---
Tetonka part.					
Durrstein:					
Du.					
Egas:					
Eg.					
Elsmere:					
Em	Lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Hackberry, blue spruce, green ash, ponderosa pine, Siberian crabapple.	Eastern cottonwood, golden willow.	---
Enet:					
EnA, EnB	Siberian peashrub, Tatarian honeysuckle, silver buffaloberry, Peking cotoneaster, lilac.	Ponderosa pine, green ash, Siberian crabapple, hackberry, Russian-olive, eastern redcedar.	Siberian elm	---	---
Forestburg:					
FoA, FoB	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.	---	---
[1]FrA:					
Forestburg part	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.	---	---
Doger part	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.	---	---
[1]FrB:					
Forestburg part	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, 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	>35
Forestburg:					
Doger part	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Siberian crabapple, Russian-olive.	---	---
Grat:					
Ga	Lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Hackberry, blue spruce, green ash, ponderosa pine, Siberian crabapple.	Eastern cottonwood, golden willow.	---
Great Bend:					
GbA	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
[1]GzB:					
Great Bend part	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Zell part	Tatarian honeysuckle, American plum, lilac, Peking cotoneaster.	Ponderosa pine, Russian-olive, green ash, hackberry, Rocky Mt. juniper, eastern redcedar, Siberian peashrub.	Siberian elm	---	---
Hand:					
[1]HaA:					
Hand part	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Bonilla part	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
[1]HaB:					
Hand part	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue 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	>35
Hand:					
Bonilla part	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
[1]HbC:					
Hand part	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Ethan part	Tatarian honeysuckle, American plum, lilac, Peking cotoneaster.	Ponderosa pine, Russian-olive, green ash, hackberry, Rocky Mt. juniper, eastern redcedar, Siberian peashrub.	Siberian elm	---	---
Houdek: HcB.					
[1]HdB:					
Houdek part	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Dudley part	Eastern redcedar, Rocky Mt. juniper, Siberian peashrub, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---
[1]HeB:					
Houdek part	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Ethan part	Tatarian honeysuckle, American plum, lilac, Peking cotoneaster.	Ponderosa pine, Russian-olive, green ash, hackberry, Rocky Mt. juniper, eastern redcedar, Siberian peashrub.	Siberian elm	---	---

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	>35
Houdek:					
[1]HeC:					
Houdek part	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Ethan part	Tatarian honeysuckle, American plum, lilac, Peking cotoneaster.	Ponderosa pine, Russian-olive, green ash, hackberry, Rocky Mt. juniper, eastern redcedar, Siberian peashrub.	Siberian elm	---	---
[1]HoA:					
Houdek part	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Prosper part	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Blue spruce, green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine.	Eastern cottonwood.
[1]HoB:					
Houdek part	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Prosper part	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Blue spruce, green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine.	Eastern cottonwood.
Hoven:					
Hv.					
LaDelle:					
La	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Blue spruce, green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine.	Eastern cottonwood.

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	>35
Lamo:					
Lm	Lilac, American plum.	Common chokecherry, Siberian peashrub, eastern redcedar.	Green ash, hackberry, Siberian crabapple, blue spruce, ponderosa pine.	Golden Willow, eastern cottonwood.	---
Lane:					
LnA	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Loup:					
Lo.					
Mobridge:					
Mo	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
Oko:					
OkB	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Russian-olive, eastern redcedar.	---	---
OkD.					
Pits:					
Pg.					
Prosper:					
[1]PrA:					
Prosper part	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Blue spruce, green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine.	Eastern cottonwood.
Davison part	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Green ash, hackberry, Siberian crabapple, eastern redcedar.	Golden willow, ponderosa pine, blue spruce.	Eastern cottonwood.
Shue:					
Sh	Lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Hackberry, blue spruce, green ash, ponderosa pine, Siberian crabapple.	Eastern 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	>35
Spottswood:					
Sp	Lilac	Eastern redcedar, common chokecherry, Siberian peashrub, American plum, silver buffaloberry.	Ponderosa pine, green ash, hackberry, Russian-olive, Siberian crabapple.	Blue spruce	---
Stickney:					
[1]St:					
Stickney part	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry, Siberian peashrub.	Green ash, hackberry, ponderosa pine, Russian-olive, eastern redcedar.	---	---
Jerauld part.					
Tetonka:					
Ta.					
[1]Te:					
Tetonka part.					
Hoven part.					
Zell:					
ZeC	Tatarian honeysuckle, American plum, lilac, Peking cotoneaster.	Ponderosa pine, Russian-olive, green ash, hackberry, Rocky Mt. juniper, eastern redcedar, Siberian peashrub.	Siberian elm	---	---

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole 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 herba-ceous plants	Hardwood trees	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
BaA-----------------Beadle	Good	Fair	Good	Fair	Very poor	Very poor	Good	Very poor	Good.
BaB-----------------Beadle	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
BaC-----------------Beadle	Poor	Fair	Good	Fair	Very poor	Very poor	Poor	Very poor	Good.
BdA*:									
Beadle------------	Good	Fair	Good	Fair	Very poor	Very poor	Good	Very poor	Good.
Dudley------------	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
BeD-----------------Betts	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
BfD*:									
Betts-------------	Very poor	Fair	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
Ethan-------------	Very poor	Fair	Good	Poor	Very poor	Very poor	Very poor	Very poor	Good.
BnA-----------------Blendon	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Bo------------------Bon	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
Bx------------------Bon	Very poor	Good	Fair	Poor	Very poor	Very poor	Poor	Very poor	Fair.
CaA, CaB------------Carthage	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
CaC-----------------Carthage	Poor	Fair	Good	Fair	Very poor	Very poor	Poor	Very poor	Good.
CbA*, CbB*:									
Carthage----------	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Blendon-----------	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
DaB-----------------Davis	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
DeA-----------------Delmont	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
DfB*:									
Delmont-----------	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
Talmo-------------	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Dg------------------Doger	Poor	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
DkA*:									
Dudley------------	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
Jerauld-----------	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
DsA*:									
Dudley------------	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.

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
DsA*:									
Stickney----------	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
DtA*:									
Dudley------------	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
Tetonka-----------	Poor	Poor	Poor	Poor	Fair	Fair	Poor	Fair	Poor.
Du----------------- Durrstein	Very poor	Poor	Fair	Poor	Poor	Fair	Very poor	Poor	Fair.
Eg----------------- Egas	Very poor	Very poor	Fair	Poor	Poor	Poor	Very poor	Poor	Fair.
Em----------------- Elsmere	Poor	Good	Fair	Good	Poor	Poor	Fair	Poor	Fair.
EnA, EnB----------- Enet	Fair	Fair	Good	Poor	Very poor	Very poor	Fair	Very poor	Good.
FoA, FoB----------- Forestburg	Poor	Fair	Good	Fair	Very poor	Very poor	Poor	Very poor	Good.
FrA*, FrB*:									
Forestburg--------	Poor	Fair	Good	Fair	Very poor	Very poor	Poor	Very poor	Good.
Doger-------------	Poor	Fair	Good	Fair	Very poor	Very poor	Poor	Very poor	Good.
Ga----------------- Grat	Poor	Good	Fair	Good	Fair	Fair	Poor	Fair	Fair.
GbA---------------- Great Bend	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
GzB*:									
Great Bend--------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Zell--------------	Poor	Fair	Fair	Poor	Very poor	Very poor	Poor	Very poor	Fair.
HaA*:									
Hand--------------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Bonilla-----------	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
HaB*:									
Hand--------------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Bonilla-----------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
HbC*:									
Hand--------------	Fair	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Ethan-------------	Poor	Fair	Good	Poor	Very poor	Very poor	Poor	Very poor	Good.
HcB---------------- Houdek	Very poor	Very poor	Good	Poor	Very poor	Very poor	Very poor	Very poor	Good.
HdB*:									
Houdek------------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Dudley------------	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
HeB*:									
Houdek------------	Good	Good	Good	Good	Very poor	Very poor	Good	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 herba-ceous plants	Hardwood trees	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
HeB*:									
Ethan-------------	Fair	Fair	Good	Poor	Very poor	Very poor	Fair	Very poor	Good.
HeC*:									
Houdek------------	Fair	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Ethan-------------	Poor	Fair	Good	Poor	Very poor	Very poor	Poor	Very poor	Good.
HoA*:									
Houdek------------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Prosper-----------	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
HoB*:									
Houdek------------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Prosper-----------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Hv----------------- Hoven	Very poor	Poor	Poor	Poor	Fair	Fair	Very poor	Fair	Poor.
La.									
LaDelle-----------	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
Lm----------------- Lamo	Good	Good	Fair	Good	Poor	Poor	Good	Poor	Fair.
LnA---------------- Lane	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Lo----------------- Loup	Poor	Poor	Fair	Poor	Fair	Fair	Poor	Fair	Fair.
Mo----------------- Mobridge	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
OkB---------------- Oko	Poor	Fair	Good	Fair	Very poor	Very poor	Poor	Very poor	Good.
OkD---------------- Oko	Very poor	Very poor	Good	Poor	Very poor	Very poor	Very poor	Very poor	Good.
Pg*. Pits									
PrA*:									
Prosper-----------	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
Davison-----------	Good	Good	Good	Good	Poor	Poor	Good	Poor	Good.
Sh----------------- Shue	Poor	Good	Fair	Good	Fair	Poor	Fair	Poor	Fair.
Sp----------------- Spottswood	Fair	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
St*:									
Stickney----------	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Jerauld-----------	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Ta:									
Tetonka-----------	Poor	Poor	Poor	Poor	Fair	Fair	Poor	Fair	Poor.

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
Te*:									
Tetonka	Poor	Poor	Poor	Poor	Fair	Fair	Poor	Fair	Poor.
Hoven	Very poor	Poor	Poor	Poor	Fair	Fair	Very poor	Fair	Poor.
ZeC Zell	Poor	Fair	Fair	Poor	Very poor	Very poor	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
Beadle:				
BaA	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
BaB	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly.	Slight.
BaC	Moderate: percs slowly.	Slight	Severe: slope.	Slight.
[1]BdA:				
Beadle part	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Dudley part	Severe: percs slowly.	Moderate: wetness.	Severe: percs slowly.	Moderate: wetness.
Betts:				
BeD	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: large stones, slope.
[1]BfD:				
Betts part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Ethan part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Blendon:				
BnA	Slight	Slight	Slight	Slight.
Bon:				
Bo, Bx	Severe: floods.	Moderate: floods.	Moderate: floods.	Moderate: floods.
Carthage:				
CaA	Slight	Slight	Slight	Slight.
CaB	Slight	Slight	Moderate: slope.	Slight.
CaC	Slight	Slight	Severe: slope.	Slight.
[1]CbA:				
Carthage part	Slight	Slight	Slight	Slight.
Blendon part	Slight	Slight	Slight	Slight.
[1]CbB:				
Carthage part	Slight	Slight	Moderate: slope.	Slight.
Blendon part	Slight	Slight	Slight	Slight.
Davis:				
DaB	Slight	Slight	Moderate: slope.	Slight.
Delmont:				
DeA	Slight	Slight	Slight	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Delmont:				
[1]DfB:				
Delmont part	Slight	Slight	Moderate: slope.	Slight.
Talmo part	Slight	Slight	Moderate: slope, small stones.	Slight.
Doger:				
Dg	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
Dudley:				
[1]DkA:				
Dudley part	Severe: percs slowly.	Moderate: wetness.	Severe: percs slowly.	Moderate: wetness.
Jerauld part	Severe: percs slowly.	Severe: too clayey.	Severe: percs slowly.	Severe: too clayey.
[1]DsA:				
Dudley part	Severe: percs slowly.	Moderate: wetness.	Severe: percs slowly.	Moderate: wetness.
Stickney part	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
[1]DtA:				
Dudley part	Severe: percs slowly, floods.	Moderate: floods.	Severe: percs slowly, floods.	Moderate: floods.
Tetonka part	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.
Durrstein:				
Du	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.
Egas:				
Eg	Severe: floods, wetness.	Severe: wetness.	Severe: floods, wetness.	Severe: wetness.
Elsmere:				
Em	Moderate: wetness, soil blowing, too sandy.	Moderate: wetness, soil blowing, too sandy.	Moderate: too sandy, soil blowing, wetness.	Moderate: wetness, soil blowing, too sandy.
Enet:				
EnA	Slight	Slight	Slight	Slight.
EnB	Slight	Slight	Moderate: slope.	Slight.
Forestburg:				
FoA	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
FoB	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Forestburg:				
[1]FrA:				
Forestburg part	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
Doger part	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
[1]FrB:				
Forestburg part	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.
Doger part	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.
Grat:				
Ga	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Slight.
Great Bend:				
GbA	Slight	Slight	Slight	Slight.
[1]GzB:				
Great Bend part	Slight	Slight	Moderate: slope.	Slight.
Zell part	Slight	Slight	Moderate: slope.	Slight.
Hand:				
[1]HaA:				
Hand part	Slight	Slight	Slight	Slight.
Bonilla part	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
[1]HaB:				
Hand part	Slight	Slight	Moderate: slope.	Slight.
Bonilla part	Slight	Slight	Moderate: slope.	Slight.
[1]HbC:				
Hand part	Slight	Slight	Severe: slope.	Slight.
Ethan part	Slight	Slight	Severe: slope.	Slight.
Houdek:				
HcB	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones
[1]HdB:				
Houdek part	Slight	Slight	Moderate: slope.	Slight.
Dudley part	Severe: percs slowly.	Moderate: wetness.	Severe: percs slowly.	Moderate: wetness.
[1]HeB:				
Houdek part	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
Houdek:				
Ethan part	Slight	Slight	Moderate: slope.	Slight.
[1]HeC:				
Houdek part	Slight	Slight	Severe: slope.	Slight.
Ethan part	Slight	Slight	Severe: slope.	Slight.
[1]HoA:				
Houdek part	Slight	Slight	Slight	Slight.
Prosper part	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
[1]HoB:				
Houdek part	Slight	Slight	Moderate: slope.	Slight.
Prosper part	Slight	Slight	Moderate: slope.	Slight.
Hoven:				
Hv	Severe: percs slowly, floods, wetness.	Severe: wetness.	Severe: percs slowly, floods, wetness.	Severe: wetness.
LaDelle:				
La	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight.
Lamo:				
Lm	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Slight.
Lane:				
LnA	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Loup:				
Lo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Mobridge:				
Mo	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
Oko:				
OkB	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
OkD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.
Pits:				
Pg.				
Prosper:				
[1]PrA:				
Prosper part	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Prosper:				
Davison part	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight.
Shue:				
Sh	Severe: floods.	Moderate: too sandy, wetness.	Moderate: too sandy, wetness.	Moderate: wetness, too sandy.
Spottswood:				
Sp	Slight	Slight	Slight	Slight.
Stickney:				
[1]St:				
Stickney part	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Jerauld part	Severe: percs slowly.	Severe: too clayey.	Severe: percs slowly.	Severe: too clayey.
Tetonka:				
Ta	Severe: floods, wetness.	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.
[1]Te:				
Tetonka part	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.
Hoven part	Severe: percs slowly, floods, wetness.	Severe: wetness.	Severe: percs slowly, floods, wetness.	Severe: wetness.
Zell:				
ZeC	Slight	Slight	Severe: slope.	Slight.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole 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
Beadle:					
BaA, BaB, BaC	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
[1]BdA:					
Beadle part	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Dudley part	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Betts:					
BeD	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, low strength.
[1]BfD:					
Betts part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Ethan part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Blendon:					
BnA	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: low strength, frost action.
Bon:					
Bo, Bx	Severe: floods, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Carthage:					
CaA	Moderate: too clayey, wetness.	Moderate: low strength, shrink-swell.	Severe: wetness.	Moderate: low strength, shrink-swell.	Moderate: frost action, low strength.
CaB, CaC	Moderate: too clayey, wetness.	Moderate: low strength, shrink-swell.	Moderate: shrink-swell, low strength.	Moderate: low strength, shrink-swell, slope.	Moderate: frost action, low strength.
[1]CbA:					
Carthage part	Moderate: too clayey, wetness.	Moderate: low strength, shrink-swell.	Severe: wetness.	Moderate: low strength, shrink-swell.	Moderate: frost action, low strength.
Blendon part	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: low strength, frost action.
[1]CbB:					
Carthage part	Moderate: too clayey, wetness.	Moderate: low strength, shrink-swell.	Moderate: shrink-swell, low strength.	Moderate: low strength, shrink-swell, slope.	Moderate: frost action, low strength.

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
Carthage:					
Blendon part	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.
Davis:					
DaB	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: low strength, frost action, shrink-swell.
Delmont:					
DeA	Severe: cutbanks cave, small stones.	Slight	Slight	Slight	Slight.
[1]DfB:					
Delmont part	Severe: cutbanks cave, small stones.	Slight	Slight	Moderate: slope.	Slight.
Talmo part	Severe: small stones, cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Doger:					
Dg	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Dudley:					
[1]DkA:					
Dudley part	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Jerauld part	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
[1]DsA:					
Dudley part	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Stickney part	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
[1]DtA:					
Dudley part	Severe: floods.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, low strength, shrink-swell.
Tetonka part	Severe: wetness, floods.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: frost action, low strength, shrink-swell.
Durrstein:					
Du	Severe: floods, wetness, too clayey.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, low strength.

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
Egas:					
Eg	Severe: floods, too clayey, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: frost action, low strength, wetness.
Elsmere:					
Em	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action, wetness.
Enet:					
EnA	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: low strength.
EnB	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: low strength.
Forestburg:					
FoA	Moderate: wetness, cutbanks cave.	Moderate: wetness, low strength, shrink-swell.	Severe: wetness.	Moderate: low strength, shrink-swell, wetness.	Moderate: frost action, low strength.
FoB	Moderate: cutbanks cave.	Moderate: low strength, shrink-swell.	Moderate: shrink-swell, low strength.	Moderate: low strength, slope, shrink-swell.	Moderate: frost action, low strength.
[1]FrA:					
Forestburg part	Moderate: wetness, cutbanks cave.	Moderate: wetness, low strength, shrink-swell.	Severe: wetness.	Moderate: low strength, shrink-swell, wetness.	Moderate: frost action, low strength.
Doger part	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
[1]FrB:					
Forestburg part	Moderate: cutbanks cave.	Moderate: low strength, shrink-swell.	Moderate: shrink-swell, low strength.	Moderate: low strength, slope, shrink-swell.	Moderate: frost action, low strength.
Doger part	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Grat:					
Ga	Severe: wetness, floods, cutbanks cave.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: shrink-swell, floods, low strength.
Great Bend:					
GbA	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: frost action, low strength.
[1]GzB:					
Great Bend part	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, slope, low strength.	Severe: frost action, low strength.
Zell part	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: slope, low strength.	Severe: 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
Hand:					
[1]HaA:					
Hand part	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.
Bonilla part	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, low strength.
[1]HaB:					
Hand part	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: shrink-swell, low strength.
Bonilla part	Moderate: wetness.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, wetness, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
[1]HbC:					
Hand part	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: shrink-swell, low strength.
Ethan part	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.
Houdek:					
HcB	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones, low strength.
[1]HdB:					
Houdek part	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength, slope.	Severe: low strength.
Dudley part	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
[1]HeB:					
Houdek part	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength, slope.	Severe: low strength.
Ethan part	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.
[1]HeC:					
Houdek part	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength, slope.	Severe: low strength.
Ethan part	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.

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
Houdek:					
[1]HoA:					
Houdek part----	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
Prosper part---	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.
[1]HoB:					
Houdek part----	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength, slope.	Severe: low strength.
Prosper part---	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
Hoven:					
Hv---------------	Severe: too clayey, floods, wetness.	Severe: shrink-swell, floods, wetness.	Severe: shrink-swell, floods, wetness.	Severe: shrink-swell, floods, wetness.	Severe: shrink-swell, low strength, floods.
LaDelle:					
La---------------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action, low strength.
Lamo:					
Lm---------------	Severe: wetness, floods.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: floods, shrink-swell, frost action.
Lane:					
LnA--------------	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Loup:					
Lo---------------	Severe: wetness, cutbanks cave.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness.
Mobridge:					
Mo---------------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, low strength.
Oko:					
OkB--------------	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
OkD--------------	Severe: slope, too clayey.	Severe: shrink-swell, low strength, slope.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, low strength, shrink-swell.
Pits:					
Pg.					

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
Prosper:					
[1]PrA:					
Prosper part---	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.
Davison part---	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.
Shue:					
Sh---------------	Severe: cutbanks cave, wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Moderate: wetness, frost action.
Spottswood:					
Sp---------------	Severe: cutbanks cave.	Slight-----------	Moderate: wetness.	Slight------------	Moderate: frost action, low strength.
Stickney:					
[1]St:					
Stickney part--	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Jerauld part---	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Tetonka:					
Ta---------------	Severe: wetness, floods.	Severe: floods, shrink-swell, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, low strength.
[1]Te:					
Tetonka part---	Severe: wetness, floods.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: frost action, low strength, shrink-swell.
Hoven part-----	Severe: too clayey, floods, wetness.	Severe: shrink-swell, floods, wetness.	Severe: shrink-swell, floods, wetness.	Severe: shrink-swell, floods, wetness.	Severe: shrink-swell, low strength, floods.
Zell:					
ZeC--------------	Slight-----------	Moderate: low strength.	Moderate: low strength.	Moderate: slope, low strength.	Severe: frost action.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole 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
BaA: Beadle	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
BaB: Beadle	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
BaC: Beadle	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey.
BdA*:					
Beadle	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
Dudley	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey, hard to pack.
BeD: Betts	Severe: percs slowly, slope.	Severe: slope.	Moderate: large stones, slope.	Severe: slope.	Poor: slope.
BfD*:					
Betts	Severe: percs slowly, slope.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope.	Poor: slope.
Ethan	Severe: slope, percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope.	Poor: slope.
BnA: Blendon	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
Bo, Bx: Bon	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
CaA, CaB: Carthage	Severe: percs slowly.	Severe: seepage.	Moderate: too clayey.	Severe: seepage.	Good.
CaC: Carthage	Severe: percs slowly.	Severe: seepage, slope.	Moderate: too clayey.	Severe: seepage.	Good.
CbA*, CbB*:					
Carthage	Severe: percs slowly.	Severe: seepage.	Moderate: too clayey.	Severe: seepage.	Good.
Blendon	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
DaB: Davis	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Good.
DeA: Delmont	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
DfB*:					
Delmont	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.

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
DfB*:					
Talmo	Slight	Severe: seepage.	Severe: seepage, small stones.	Severe: seepage.	Poor: thin layer.
Dg Doger	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
DkA*:					
Dudley	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey, hard to pack.
Jerauld	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
DsA*:					
Dudley	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey, hard to pack.
Stickney	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
DtA*:					
Dudley	Severe: percs slowly, floods.	Slight	Severe: floods.	Severe: floods.	Fair: too clayey, hard to pack.
Tetonka	Severe: floods, percs slowly, wetness.	Slight	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Du Durrstein	Severe: floods, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: too clayey, wetness.
Eg Egas	Severe: floods, percs slowly, wetness.	Severe: floods.	Severe: floods, too clayey, wetness.	Severe: floods, wetness.	Poor: too clayey, wetness.
Em Elsmere	Severe: wetness.	Severe: wetness, seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
EnA, EnB Enet	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer, area reclaim.
FoA Forestburg	Severe: wetness, percs slowly.	Severe: seepage.	Moderate: wetness.	Severe: seepage.	Fair: too sandy.
FoB Forestburg	Severe: percs slowly.	Severe: seepage.	Moderate: too clayey, wetness.	Severe: seepage.	Fair: too sandy.
FrA*:					
Forestburg	Severe: wetness, percs slowly.	Severe: seepage.	Moderate: wetness.	Severe: seepage.	Fair: too sandy.
Doger	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.

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
FrB*:					
Forestburg	Severe: percs slowly.	Severe: seepage.	Moderate: too clayey, wetness.	Severe: seepage.	Fair: too sandy.
Doger	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
Ga Grat	Severe: wetness, floods, percs slowly.	Severe: wetness, seepage.	Severe: wetness, floods, seepage.	Severe: wetness, floods.	Poor: too clayey.
GbA Great Bend	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
GzB*:					
Great Bend	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Zell	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Good.
HaA*:					
Hand	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
Bonilla	Severe: floods, percs slowly.	Moderate: seepage.	Severe: floods.	Severe: floods.	Fair: too clayey.
HaB*:					
Hand	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Good.
Bonilla	Severe: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Fair: too clayey.
HbC*:					
Hand	Moderate: percs slowly.	Severe: slope.	Slight	Slight	Good.
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
HcB Houdek	Severe: large stones, percs slowly.	Moderate: large stones, slope.	Severe: large stones.	Slight	Poor: large stones.
HdB*:					
Houdek	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Dudley	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey, hard to pack.
HeB*:					
Houdek	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Ethan	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
HeC*:					
Houdek	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
HoA*:					
Houdek	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
Prosper	Severe: floods, percs slowly.	Slight	Severe: floods.	Severe: floods.	Fair: too clayey.
HoB*:					
Houdek	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Prosper	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey, wetness.	Slight	Fair: too clayey.
Hv Hoven	Severe: percs slowly, floods.	Slight	Severe: too clayey, floods, wetness.	Severe: floods, wetness.	Poor: too clayey, wetness, hard to pack.
La LaDelle	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Good.
Lm Lamo	Severe: percs slowly, wetness.	Severe: floods.	Severe: wetness, floods.	Severe: wetness, floods.	Fair: too clayey.
LnA Lane	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
Lo Loup	Severe: wetness.	Severe: wetness, seepage, floods.	Severe: wetness, seepage, too sandy.	Severe: wetness, seepage.	Poor: wetness.
Mo Mobridge	Severe: floods.	Moderate: seepage.	Severe: floods.	Severe: floods.	Fair: too clayey.
OkB Oko	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey.
OkD Oko	Severe: slope, percs slowly.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: slope, too clayey.
Pg*. Pits					
PrA*:					
Prosper	Severe: floods, percs slowly.	Slight	Severe: floods.	Severe: floods.	Fair: too clayey.
Davison	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	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
Sh-------------------Shue	Severe: wetness, percs slowly.	Severe: wetness, seepage, floods.	Severe: wetness, seepage.	Severe: wetness, seepage.	Fair: too sandy.
Sp-------------------Spottswood	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Moderate: wetness, seepage.	Fair: thin layer.
St*:					
Stickney------------	Severe: percs slowly.	Slight-----------	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Jerauld-------------	Severe: percs slowly.	Slight-----------	Severe: too clayey.	Slight-----------	Poor: too clayey.
Ta-------------------Tetonka	Severe: floods, percs slowly, wetness.	Slight-----------	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness, too clayey.
Te*:					
Tetonka-------------	Severe: floods, percs slowly, wetness.	Slight-----------	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Hoven---------------	Severe: percs slowly, floods.	Slight-----------	Severe: too clayey, floods, wetness.	Severe: floods, wetness.	Poor: too clayey, wetness, hard to pack.
ZeC------------------Zell	Moderate: percs slowly.	Severe: slope.	Slight-----------	Slight-----------	Good.

* 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
Beadle:				
BaA, BaB, BaC	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
[1]BdA:				
Beadle part	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Dudley part	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
Betts:				
BeD	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones, slope.
[1]BfD:				
Betts part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, slope.
Ethan part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Blendon:				
BnA	Good	Fair: excess fines.	Unsuited: excess fines.	Good.
Bon:				
Bo, Bx	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Carthage:				
CaA, CaB, CaC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
[1]CbA:				
Carthage part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Blendon part	Good	Fair: excess fines.	Unsuited: excess fines.	Good.
[1]CbB:				
Carthage part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Blendon part	Good	Fair: excess fines.	Unsuited: excess fines.	Good.
Davis:				
DaB	Fair: low strength, shrink-swell.	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
Delmont:				
DeA	Good	Fair: excess fines.	Fair: excess fines.	Fair: thin layer, area reclaim.
[1]DfB:				
Delmont part	Good	Fair: excess fines.	Fair: excess fines.	Fair: thin layer, area reclaim.
Talmo part	Good	Fair: excess fines.	Good	Poor: thin layer, area reclaim.
Doger:				
Dg	Good	Poor: excess fines.	Unsuited: excess fines.	Fair: too sandy.
Dudley:				
[1]DkA:				
Dudley part	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
Jerauld part	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, excess sodium.
[1]DsA:				
Dudley part	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
Stickney part	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
[1]DtA:				
Dudley part	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: area reclaim.
Tetonka part	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Durrstein:				
Du	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, excess salt.
Egas:				
Eg	Poor: shrink-swell, wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess salt, wetness.
Elsmere:				
Em	Fair: thin layer, wetness.	Poor: excess fines.	Unsuited: excess fines.	Fair: too sandy.
Enet:				
EnA, EnB	Good	Fair: excess fines.	Good	Fair: small stones.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Forestburg:				
FoA, FoB	Fair: low strength.	Poor: excess fines, thin layer.	Unsuited: excess fines.	Fair: too sandy.
[1]FrA:				
Forestburg part	Fair: low strength.	Poor: excess fines, thin layer.	Unsuited: excess fines.	Fair: too sandy.
Doger part	Good	Poor: excess fines.	Unsuited: excess fines.	Fair: too sandy.
[1]FrB:				
Forestburg part	Fair: low strength.	Poor: excess fines, thin layer.	Unsuited: excess fines.	Fair: too sandy.
Doger part	Good	Poor: excess fines.	Unsuited: excess fines.	Fair: too sandy.
Grat:				
Ga	Poor: low strength, shrink-swell.	Poor: thin layer.	Poor: thin layer.	Poor: thin layer.
Great Bend:				
GbA	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
[1]GzB:				
Great Bend part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Zell part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Hand:				
[1]HaA:				
Hand part	Fair: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Bonilla part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
[1]HaB:				
Hand part	Fair: shrink-swell, low strength.	Unsuited: exces fines.	Unsuited: excess fines.	Good.
Bonilla part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
[1]HbC:				
Hand part	Fair: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Ethan part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Houdek:				
HcB	Poor: large stones, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones.
[1]HdB:				
Houdek part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Dudley part	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
[1]HeB:				
Houdek part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Ethan part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
[1]HeC:				
Houdek part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Ethan part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
[1]HoA:				
Houdek part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Prosper part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
[1]HoB:				
Houdek part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Prosper part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Hoven:				
Hv	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, wetness.
LaDelle:				
La	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Lamo:				
Lm	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Lane:				
LnA	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Loup:				
Lo	Poor: wetness.	Fair: excess fines.	Unsuited: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Mobridge:				
Mo	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Oko:				
OkB	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
OkD	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer.
Pits:				
Pg.				
Prosper:				
[1]PrA:				
Prosper part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Davison part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Shue:				
Sh	Fair: low strength, wetness.	Poor: excess fines, thin layer.	Unsuited: excess fines.	Fair: too sandy.
Spottswood:				
Sp	Fair: low strength.	Fair: excess fines.	Fair: excess fines.	Fair: thin layer.
Stickney:				
[1]St:				
Stickney part	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Jerauld part	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, excess sodium.
Tetonka:				
Ta	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
[1]Te:				
Tetonka part	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Hoven part	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, wetness.
Zell:				
ZeC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole 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
Beadle:						
BaA	Favorable	Low strength, compressible.	Not needed	Slow intake, percs slowly.	Not needed	Favorable.
BaB	Slope	Low strength, compressible.	Not needed	Slow intake, percs slowly.	Percs slowly	Slope, erodes easily.
BaC	Slope	Low strength, compressible.	Not needed	Slope, slow intake, percs slowly.	Percs slowly	Slope, erodes easily.
[1]BdA:						
Beadle part	Favorable	Low strength, compressible.	Not needed	Slow intake, percs slowly.	Not needed	Favorable.
Dudley part	Favorable	Low strength, compressible, shrink-swell.	Percs slowly	Slow intake, percs slowly, excess sodium.	Not needed	Excess sodium, droughty.
Betts:						
BeD	Slope	Low strength, large stones.	Not needed	Large stones, slope.	Large stones, slope.	Large stones, slope, erodes easily.
[1]BfD:						
Betts part	Slope	Low strength, shrink-swell.	Not needed	Slope	Slope	Slope, erodes easily.
Ethan part	Slope	Low strength, compressible, shrink-swell.	Not needed	Complex slope	Slope	Slope, erodes easily.
Blendon:						
BnA	Seepage	Seepage, piping.	Not needed	Seepage	Not needed	Favorable.
Bon:						
Bo, Bx	Seepage	Low strength, piping.	Floods	Floods	Not needed	Favorable.
Carthage:						
CaA	Favorable	Low strength, piping.	Not needed	Soil blowing, percs slowly, seepage.	Not needed	Favorable.
CaB	Slope	Low strength, piping.	Not needed	Soil blowing, percs slowly, seepage.	Soil blowing, slope.	Slope, erodes easily.
CaC	Slope	Low strength, piping.	Not needed	Soil blowing, slope.	Soil blowing, slope.	Slope, erodes easily.
[1]CbA:						
Carthage part	Favorable	Low strength, piping.	Not needed	Soil blowing, percs slowly, seepage.	Not needed	Favorable.
Blendon part	Seepage	Seepage, piping.	Not needed	Seepage	Not needed	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
Carthage:						
[1]CbB:						
Carthage part	Slope	Low strength, piping.	Not needed	Soil blowing, percs slowly, seepage.	Soil blowing, slope.	Slope erodes easily.
Blendon part	Seepage	Seepage, piping.	Not needed	Seepage	Not needed	Favorable.
Davis:						
DaB	Seepage	Low strength	Not needed	Slope	Favorable	Slope, erodes easily.
Delmont:						
DeA	Seepage	Seepage, piping.	Not needed	Fast intake, droughty.	Complex slope, too sandy, rooting depth.	Droughty, erodes easily, rooting depth.
[1]DfB:						
Delmont part	Seepage	Seepage, piping.	Not needed	Fast intake, droughty.	Complex slope, too sandy, rooting depth.	Droughty, erodes easily, rooting depth.
Talmo part	Seepage, slope.	Seepage	Not needed	Fast intake, droughty, seepage.	Not needed	Droughty, slope, erodes easily.
Doger:						
Dg	Seepage	Piping, seepage.	Not needed	Fast intake, soil blowing.	Too sandy, soil blowing.	Not needed.
Dudley:						
[1]DkA:						
Dudley part	Favorable	Low strength, compressible, shrink-swell.	Percs slowly	Slow intake, percs slowly, excess sodium.	Not needed	Excess sodium, droughty.
Jerauld part	Favorable	Shrink-swell, low strength.	Excess sodium, percs slowly, excess salt.	Slow intake, excess salt, excess sodium.	Not needed	Excess salt, excess sodium, percs slowly.
[1]DsA:						
Dudley part	Favorable	Low strength, compressible, shrink-swell.	Percs slowly	Slow intake, percs slowly, excess sodium.	Not needed	Excess sodium, droughty.
Stickney part	Favorable	Low strength, compressible, hard to pack.	Percs slowly, poor outlets.	Slow intake, percs slowly, excess salt.	Not needed	Favorable.
[1]DtA:						
Dudley part	Favorable	Low strength, shrink-swell, compressible.	Percs slowly, floods.	Slow intake, percs slowly, excess sodium.	Not needed	Excess sodium, percs slowly.
Tetonka part	Favorable	Low strength, compressible, shrink-swell.	Poor outlets, percs slowly, floods.	Slow intake, floods, percs slowly.	Not needed	Wetness.
Durrstein:						
Du	Favorable	Low strength, compressible, hard to pack.	Floods, frost action, excess salt.	Floods, excess salt, excess sodium.	Not needed	Excess sodium, excess salt, wetness.
Egas:						
Eg	Favorable	Low strength, shrink-swell, compressible.	Poor outlets, percs slowly.	Slow intake, floods, excess salt.	Not needed	Excess salt.

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
Elsmere:						
Em	Seepage	Piping, seepage.	Poor outlets, cutbanks cave.	Fast intake, seepage.	Not needed	Not needed.
Enet:						
EnA	Seepage	Low strength	Not needed	Complex slope, droughty, seepage.	Not needed	Droughty.
EnB	Seepage	Low strength	Not needed	Complex slope, droughty, seepage.	Complex slope	Slope, erodes easily.
Forestburg:						
FoA	Favorable	Low strength	Not needed	Soil blowing, percs slowly, seepage.	Not needed	Erodes easily.
FoB	Slope, seepage.	Low strength	Not needed	Soil blowing, percs slowly, seepage.	Soil blowing, too sandy.	Slope, erodes easily.
[1]FrA:						
Forestburg part	Favorable	Low strength	Not needed	Soil blowing, percs slowly, seepage.	Not needed	Erodes easily.
Doger part	Seepage	Piping, seepage.	Not needed	Fast intake, soil blowing.	Too sandy, soil blowing.	Not needed.
[1]FrB:						
Forestburg part	Slope, seepage.	Low strength	Not needed	Soil blowing, percs slowly, seepage.	Soil blowing, too sandy.	Slope, erodes easily.
Doger part	Seepage	Piping, seepage.	Not needed	Fast intake, soil blowing.	Too sandy, soil blowing.	Not needed.
Grat:						
Ga	Favorable	Low strength	Floods, poor outlets.	Wetness, floods.	Not needed	Favorable.
Great Bend:						
GbA	Favorable	Piping, low strength.	Not needed	Favorable	Favorable	Favorable.
[1]GzB:						
Great Bend part	Slope	Piping, low strength.	Not needed	Favorable	Favorable	Slope, erodes easily.
Zell part	Slope, seepage.	Piping, erodes easily low strength.	Not needed	Favorable	Erodes easily, piping.	Erodes easily, slope.
Hand:						
[1]HaA:						
Hand part	Seepage	Low strength	Not needed	Slope	Not needed	Favorable.
Bonilla part	Seepage	Low strength, piping.	Poor outlets	Complex slope	Not needed	Favorable.
[1]HaB:						
Hand part	Slope, seepage.	Low strength	Not needed	Slope	Complex slope	Slope, erodes easily.
Bonilla part	Seepage	Low strength, piping.	Not needed	Complex slope	Complex slope	Slope, erodes easily.

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
Hand:						
[1]HbC:						
Hand part	Slope, seepage.	Low strength	Not needed	Slope	Complex slope	Slope, erodes easily.
Ethan part	Slope	Low strength, compressible, shrink-swell.	Not needed	Complex slope	Complex slope	Slope, erodes easily.
Houdek:						
HcB	Slope	Large stones, low strength.	Not needed	Large stones	Large stones, complex slope.	Large stones.
[1]HdB:						
Houdek part	Slope	Low strength	Not needed	Complex slope, slow intake.	Complex slope	Slope, erodes easily.
Dudley part	Slope	Low strength, compressible, shrink-swell.	Percs slowly	Slow intake, percs slowly, excess sodium.	Percs slowly, excess sodium.	Slope, erodes easily, excess sodium.
[1]HeB:						
Houdek part	Slope	Low strength	Not needed	Complex slope, slow intake.	Complex slope	Slope, erodes easily.
Ethan part	Slope	Low strength, compressible, shrink-swell.	Not needed	Complex slope	Complex slope	Slope, erodes easily.
[1]HeC:						
Houdek part	Slope	Low strength	Not needed	Slope	Complex slope	Slope, erodes easily.
Ethan part	Slope	Low strength, compressible, shrink-swell.	Not needed	Complex slope	Complex slope	Slope, erodes easily.
[1]HoA:						
Houdek part	Favorable	Low strength	Not needed	Slow intake	Not needed	Favorable.
Prosper part	Favorable	Low strength	Poor outlets, percs slowly.	Slow intake, complex slope.	Not needed	Favorable.
[1]HoB:						
Houdek part	Slope	Low strength	Not needed	Complex slope, slow intake.	Complex slope	Slope, erodes easily.
Prosper part	Slope	Low strength	Not needed	Slow intake, complex slope.	Complex slope	Slope, erodes easily.
Hoven:						
Hv	Favorable	Shrink-swell, low strength, hard to pack.	Percs slowly, poor outlets, excess salt.	Excess salt, floods, slow intake.	Not needed	Excess salt, wetness.
LaDelle:						
La	Seepage	Low strength	Floods	Floods	Favorable	Favorable.
Lamo:						
Lm	Favorable	Compressible, erodes easily shrink-swell.	Floods, percs slowly.	Percs slowly, floods, wetness.	Wetness	Not needed.
Lane:						
LnA	Favorable	Hard to pack, low strength, shrink-swell.	Not needed	Slow intake	Percs slowly	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
Loup:						
Lo	Seepage	Seepage, piping.	Poor outlets, cutbanks cave.	Wetness, seepage.	Not needed	Not needed.
Mobridge:						
Mo	Seepage	Low strength, compressible.	Floods, poor outlets.	Favorable	Not needed	Favorable.
Oko:						
OkB	Slope	Compressible, low strength, shrink-swell.	Not needed	Slope, percs slowly, slow intake.	Percs slowly	Slope, percs slowly, erodes easily.
OkD	Slope	Compressible, low strength, shrink-swell.	Not needed	Slope, percs slowly, slow intake.	Slope, percs slowly.	Slope, percs slowly, erodes easily.
Pits:						
Pg.						
Prosper:						
[1]PrA:						
Prosper part	Favorable	Low strength	Poor outlets, percs slowly.	Slow intake, complex slope.	Not needed	Favorable.
Davison part	Seepage	Low strength, piping.	Complex slope, poor outlets.	Complex slope, excess lime.	Not needed	Favorable.
Shue:						
Sh	Seepage	Seepage, piping.	Cutbanks cave, poor outlets.	Fast intake, wetness.	Not needed	Not needed.
Spottswood:						
Sp	Seepage	Piping	Seepage, wetness.	Seepage, wetness.	Not needed	Not needed.
Stickney:						
[1]St:						
Stickney part	Favorable	Low strength, compressible, hard to pack.	Percs slowly, poor outlets.	Slow intake, percs slowly, excess salt.	Not needed	Favorable.
Jerauld part	Favorable	Shrink-swell, low strength.	Excess sodium, percs slowly, excess salt.	Slow intake, excess salt, excess sodium.	Not needed	Excess salt, excess sodium, percs slowly.
Tetonka:						
Ta	Favorable	Low strength, compressible, shrink-swell.	Poor outlets, floods, percs slowly.	Slow intake, floods, percs slowly.	Not needed	Wetness.
[1]Te:						
Tetonka part	Favorable	Low strength, compressible, shrink-swell.	Poor outlets, percs slowly, floods.	Slow intake, floods, percs slowly.	Not needed	Wetness.
Hoven part	Favorable	Shrink-swell, low strength, hard to pack.	Percs slowly, poor outlets, excess salt.	Excess salt, floods, slow intake.	Not needed	Excess salt, wetness.
Zell:						
ZeC	Slope, seepage.	Piping, erodes easily low strength.	Not needed	Erodes easily, slope.	Erodes easily, piping.	Erodes easily, slope.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole 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		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Beadle:											
BaA, BaB, BaC	0-7	Loam	CL	A-6, A-7	0	100	95-100	85-100	65-90	30-50	10-25
	7-30	Clay loam, clay	CL, CH	A-7	0	100	95-100	85-100	70-95	40-60	15-35
	30-60	Clay loam, clay	CL, CH	A-6, A-7	0-5	95-100	90-100	75-95	55-85	35-55	15-30
[1]BdA:											
Beadle part	0-7	Loam	CL	A-6, A-7	0	100	95-100	85-100	65-90	30-50	10-25
	7-30	Clay loam, clay	CL, CH	A-7	0	100	95-100	85-100	70-95	40-60	15-35
	30-60	Clay loam, clay	CL, CH	A-6, A-7	0-5	95-100	90-100	75-95	55-85	35-55	15-30
Dudley part	0-9	Silt loam	CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	65-90	25-40	5-20
	9-22	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	95-100	95-100	85-100	65-95	35-60	15-35
	22-60	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-50	10-25
Betts:											
BeD	0-9	Stony loam	CL, CL-ML	A-4, A-6	10-25	100	90-100	85-100	60-75	25-40	5-15
	9-27	Loam, clay loam, stony clay loam.	CL	A-6, A-7	5-20	100	90-100	85-100	50-85	30-45	10-20
	27-60	Loam, clay loam, stony clay loam.	CL	A-6, A-7	5-20	100	90-100	85-100	50-85	30-45	10-20
[1]BfD:											
Betts part	0-9	Loam	CL, CL-ML	A-4, A-6	0-5	90-100	80-100	75-100	60-75	20-38	5-15
	9-27	Loam, clay loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	50-85	30-45	10-25
	27-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	50-85	30-45	10-25
Ethan part	0-9	Loam	CL, ML, CL-ML	A-4, A-6	0	95-100	90-100	80-95	55-80	25-40	5-20
	9-39	Loam, clay loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	55-80	30-45	10-25
	39-60	Loam, clay loam	CL-ML, CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	25-50	5-25
Blendon:											
BnA	0-10	Fine sandy loam	SM, SM-SC	A-2, A-4	0	100	100	60-100	25-50	20-30	NP-5
	10-32	Fine sandy loam, sandy loam.	SM, SM-SC	A-2, A-4	0	100	100	60-100	25-50	20-30	NP-5
	32-60	Fine sandy loam, loamy fine sand, loamy sand.	SM, SM-SC, SP-SM	A-2	0	100	90-100	50-100	10-35	<30	NP-5
Bon:											
Bo, Bx	0-31	Silt loam	CL-ML, CL	A-4, A-6	0	100	95-100	75-95	60-85	20-38	5-20
	31-60	Stratified clay loam to loamy fine sand.	CL-ML, SM, SC, ML	A-2, A-4	0	90-100	85-100	50-90	30-75	<20	NP-10
Carthage:											
CaA, CaB, CaC	0-8	Fine sandy loam	SM, SC, CL-ML, SM-SC	A-2, A-4	0-5	95-100	90-100	60-100	25-55	20-30	NP-10
	8-32	Loamy fine sand, loamy sand, fine sandy loam.	SM, SM-SC, SC, CL-ML	A-2, A-4	0-5	95-100	90-100	50-100	15-55	<25	NP-10
	32-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	95-100	95-100	80-95	55-80	30-45	8-20

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	
Carthage:											
[1]CbA:											
Carthage part---	0-8	Fine sandy loam	SM, SC, CL-ML, SM-SC	A-2, A-4	0-5	95-100	90-100	60-100	25-55	20-30	NP-10
	8-32	Loamy fine sand, loamy sand, fine sandy loam.	SM, SM-SC, SC, CL-ML	A-2, A-4	0-5	95-100	90-100	50-100	15-55	<25	NP-10
	32-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	95-100	95-100	80-95	55-80	30-45	8-20
Blendon part-----	0-10	Fine sandy loam	SM, SM-SC	A-2, A-4	0	100	100	60-100	25-50	20-30	NP-5
	10-32	Fine sandy loam, sandy loam.	SM, SM-SC	A-2, A-4	0	100	100	60-100	25-50	20-30	NP-5
	32-60	Fine sandy loam, loamy fine sand, loamy sand.	SM, SM-SC, SP-SM	A-2	0	100	90-100	50-100	10-35	<30	NP-5
[1]CbB:											
Carthage part---	0-8	Fine sandy loam	SM, SC, CL-ML, SM-SC	A-2, A-4	0-5	95-100	90-100	60-100	25-55	20-30	NP-10
	8-32	Loamy fine sand, loamy sand, fine sandy loam.	SM, SM-SC, SC, CL-ML	A-2, A-4	0-5	95-100	90-100	50-100	15-55	<25	NP-10
	32-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	95-100	95-100	80-95	55-80	30-45	8-20
Blendon part-----	0-10	Fine sandy loam	SM, SM-SC	A-2, A-4	0	100	100	60-100	25-50	20-30	NP-5
	10-32	Fine sandy loam, sandy loam.	SM, SM-SC	A-2, A-4	0	100	100	60-100	25-50	20-30	NP-5
	32-60	Fine sandy loam, loamy fine sand, loamy sand.	SM, SM-SC, SP-SM	A-2	0	100	90-100	50-100	10-35	<30	NP-5
Davis:											
DaB----------------	0-7	Loam-------------	CL, ML, CL-ML	A-4, A-6	0	100	90-100	80-100	60-85	25-40	5-20
	7-30	Loam, silt loam, clay loam.	CL, ML, CL-ML	A-4, A-6	0	100	90-100	80-100	60-85	25-40	5-20
	30-60	Loam, clay loam	CL, ML, CL-ML	A-4, A-6	0	100	95-100	85-100	55-90	25-40	5-20
Delmont:											
DeA----------------	0-7	Loam-------------	ML, CL	A-6	0	90-100	90-100	80-95	60-75	28-40	8-20
	7-16	Loam, fine sandy loam, sandy loam.	SC, CL, CL-ML, SM-SC	A-4, A-6	0	80-100	70-100	60-100	35-70	20-40	5-18
	16-60	Sand and gravel	SW-SM, SM, SP-SM, SM-SC	A-1, A-2	0-5	60-100	40-70	15-50	5-30	<25	NP-5
[1]DfB:											
Delmont part-----	0-7	Loam-------------	ML, CL	A-6	0	90-100	90-100	80-95	60-75	28-40	8-20
	7-16	Loam, fine sandy loam, sandy loam.	SC, CL, CL-ML, SM-SC	A-4, A-6	0	80-100	70-100	60-100	35-70	20-40	5-18
	16-60	Sand and gravel	SW-SM, SM, SP-SM, SM-SC	A-1, A-2	0-5	60-100	40-70	15-50	5-30	<25	NP-5

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	
Delmont:											
Talmo part	0-7	Sandy loam	CL, SC, SM-SC	A-4, A-6	0-5	80-100	70-100	55-95	40-75	20-35	5-15
	7-60	Sand and gravel	GW, GM, SW, SM	A-1	0-5	40-80	30-50	15-35	0-15	<20	NP-5
Doger:											
Dg	0-24	Loamy fine sand	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	95-100	5-35	<25	NP-5
	24-60	Loamy fine sand, loamy sand, fine sand.	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	95-100	5-35	<25	NP-5
Dudley:											
[1]DkA:											
Dudley part	0-9	Silt loam	CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	65-90	25-40	5-20
	9-22	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	95-100	95-100	85-100	65-95	35-60	15-35
	22-60	Loam, clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-50	10-25
Jerauld part	0-2	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	60-100	25-40	5-15
	2-11	Silty clay, clay, clay loam.	CH, MH, CL	A-7	0	100	95-100	90-100	75-95	45-70	20-45
	11-60	Silty clay, clay, clay loam.	CL, CH, MH	A-7	0	100	95-100	85-100	75-100	45-85	20-60
[1]DsA:											
Dudley part	0-9	Silt loam	CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	65-90	25-40	5-20
	9-22	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	95-100	95-100	85-100	65-95	35-60	15-35
	22-60	Loam, clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-50	10-25
Stickney part	0-11	Silt loam	CL	A-4, A-6	0	100	95-100	85-95	60-90	30-40	8-15
	11-26	Clay loam, silty clay loam, clay.	CL, CH, MH	A-6, A-7	0	100	95-100	85-100	65-95	35-60	14-35
	26-60	Clay loam, loam	CL, CH, MH	A-6, A-7	0-5	95-100	90-100	80-100	55-90	35-55	10-30
[1]DtA:											
Dudley part	0-9	Silt loam	CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	65-90	25-40	5-20
	9-22	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	95-100	95-100	85-100	65-95	35-60	15-35
	22-60	Clay loam, loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	11-25
Tetonka part	0-14	Silt loam	ML, CL	A-4, A-6	0	100	100	95-100	80-100	27-40	5-15
	14-42	Clay, silty clay, clay loam.	CL, CH	A-6, A-7	0	100	95-100	85-100	65-100	35-65	15-40
	42-60	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	100	90-100	80-100	55-95	30-65	15-40
Durrstein:											
Du	0-4	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	60-90	20-35	5-15
	4-20	Silty clay, clay	CH, MH	A-7	0	100	100	90-100	75-95	50-85	20-50
	20-60	Silty clay, clay, clay loam.	CH, CL, MH	A-7	0	100	100	90-100	75-95	40-75	15-50

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	
Egas:											
Eg-----------------	0-3	Silty clay loam	CH, MH	A-7	0	100	100	95-100	90-100	50-90	22-50
	3-60	Silty clay, silty clay loam, clay loam.	CH, MH	A-7	0	100	100	90-100	85-100	50-90	22-50
Elsmere:											
Em-----------------	0-24	Loamy fine sand	SM, SM-SC	A-2	0	100	90-100	50-75	15-45	<25	NP-5
	24-44	Fine sand, loamy fine sand, loamy sand.	SM, SM-SC	A-2	0	100	90-100	50-75	15-45	<25	NP-5
	44-60	Clay loam, loam, fine sandy loam.	CL, ML, SM	A-4, A-6, A-7	0	100	90-100	60-100	45-90	25-45	5-20
Enet:											
EnA, EnB-----------	0-22	Loam-------------	ML, CL	A-4, A-6	0	90-100	85-100	70-95	55-80	30-40	7-17
	22-25	Loam, fine sandy loam, sandy loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	0	90-100	85-95	60-95	45-75	20-40	5-15
	25-60	Sand and gravel	SW, SW-SM, SM, SM-SC	A-1, A-2, A-3	0	60-85	45-70	10-60	0-15	<20	NP-5
Forestburg:											
FoA, FoB-----------	0-6	Loamy fine sand	SM, SM-SC	A-2	0-5	95-100	90-100	70-100	15-35	<25	NP-5
	6-29	Loamy sand, loamy fine sand.	SM, SM-SC	A-2	0-5	95-100	90-100	70-100	15-35	<25	NP-5
	29-50	Loam, clay loam	ML, CL	A-4, A-6, A-7	0-5	95-100	95-100	80-95	60-90	30-45	8-20
	50-60	Stratified loamy sand to silt loam.	SC, CL, SM-SC, CL-ML	A-4, A-6, A-2	0-5	95-100	90-100	60-90	25-90	20-40	5-15
[1]FrA:											
Forestburg part-	0-6	Loamy fine sand	SM, SM-SC	A-2	0-5	95-100	90-100	70-100	15-35	<25	NP-5
	6-29	Loamy sand, loamy fine sand.	SM, SM-SC	A-2	0-5	95-100	90-100	70-100	15-35	<25	NP-5
	29-50	Loam, clay loam	ML, CL	A-4, A-6, A-7	0-5	95-100	95-100	80-95	60-90	30-45	8-20
	50-60	Stratified loamy sand to silt loam.	SC, CL, SM-SC, CL-ML	A-4, A-6, A-2	0-5	95-100	90-100	60-90	25-90	20-40	5-15
Doger part------	0-11	Loamy fine sand	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	95-100	5-35	<25	NP-5
	11-60	Loamy fine sand, loamy sand, fine sand.	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	95-100	5-35	<25	NP-5
[1]FrB:											
Forestburg part-	0-6	Loamy fine sand	SM, SM-SC	A-2	0-5	95-100	90-100	70-100	15-35	<25	NP-5
	6-29	Loamy sand, loamy fine sand.	SM, SM-SC	A-2	0-5	95-100	90-100	70-100	15-35	<25	NP-5
	29-50	Loam, clay loam	ML, CL	A-4, A-6, A-7	0-5	95-100	95-100	80-95	60-90	30-45	8-20
	50-60	Stratified loamy sand to silt loam.	SC, CL, SM-SC, CL-ML	A-4, A-6, A-2	0-5	95-100	90-100	60-90	25-90	20-40	5-15

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	
Forestburg:											
Doger part-------	0-11	Loamy fine sand	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	95-100	5-35	<25	NP-5
	11-60	Loamy fine sand, loamy sand, fine sand.	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	95-100	5-35	<25	NP-5
Grat:											
Ga------------------	0-5	Loam-------------	CL, ML	A-4, A-6, A-7	0	100	100	90-100	60-80	30-45	8-20
	5-31	Clay loam, clay, silty clay.	CL, CH, MH	A-7	0	100	100	90-100	70-95	45-65	15-25
	31-55	Stratified sand to gravel.	SW, SW-SM, SM, SM-SC	A-1	0	60-100	45-80	15-45	0-15	<25	NP-5
	55-60	Clay loam, loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	85-100	60-85	35-50	12-25
Great Bend:											
GbA-----------------	0-6	Silt loam--------	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
	6-20	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	100	95-100	90-100	30-45	5-20
	20-60	Stratified silt loam to silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-45	5-20
[1]GzB:											
Great Bend part-	0-6	Silt loam--------	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
	6-20	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	100	95-100	90-100	30-45	5-20
	20-60	Stratified silt loam to silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-45	5-20
Zell part--------	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	85-100	80-100	25-40	5-15
	6-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	0	100	95-100	85-100	80-100	25-40	5-15
Hand:											
[1]HaA:											
Hand part--------	0-18	Loam-------------	CL, ML, CL-ML	A-4, A-6	0-5	95-100	85-100	75-100	50-85	25-40	5-20
	18-29	Loam, clay loam	CL, ML, CL-ML	A-4, A-6	0-5	95-100	85-100	75-100	50-85	25-40	5-20
	29-60	Stratified clay loam to fine sandy loam.	CL, SC	A-4, A-6	0-5	95-100	80-100	70-100	35-80	20-40	8-20
Bonilla part-----	0-9	Loam-------------	CL-ML, CL	A-4, A-6	0	100	95-100	75-100	50-90	25-35	5-15
	9-23	Loam, clay loam	CL	A-6	0	100	95-100	85-100	60-90	30-40	10-20
	23-38	Loam, clay loam	CL	A-6	0-5	95-100	95-100	85-100	60-90	30-40	10-20
	38-60	Stratified clay loam to fine sandy loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	0-5	95-100	85-100	70-95	40-90	20-35	5-15

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	
Hand:											
[1]HaB:											
Hand part--------	0-18	Loam-------------	CL, ML, CL-ML	A-4, A-6	0-5	95-100	85-100	75-100	50-85	25-40	5-20
	18-29	Loam, clay loam	CL, ML, CL-ML	A-4, A-6	0-5	95-100	85-100	75-100	50-85	25-40	5-20
	29-60	Stratified clay loam to fine sandy loam.	CL, SC	A-4, A-6	0-5	95-100	80-100	70-100	35-80	20-40	8-20
Bonilla part-----	0-9	Loam-------------	CL-ML, CL	A-4, A-6	0	100	95-100	75-100	50-90	25-35	5-15
	9-23	Loam, clay loam	CL	A-6	0	100	95-100	85-100	60-90	30-40	10-20
	23-38	Loam, clay loam	CL	A-6	0-5	95-100	95-100	85-100	60-90	30-40	10-20
	38-60	Stratified clay loam to fine sandy loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	0-5	95-100	85-100	70-95	40-90	20-35	5-15
[1]HbC:											
Hand part--------	0-18	Loam-------------	CL, ML, CL-ML	A-4, A-6	0-5	95-100	85-100	75-100	50-85	25-40	5-20
	18-29	Loam, clay loam	CL, ML, CL-ML	A-4, A-6	0-5	95-100	85-100	75-100	50-85	25-40	5-20
	29-60	Stratified clay loam to fine sandy loam.	CL, SC	A-4, A-6	0-5	95-100	80-100	70-100	35-80	20-40	8-20
Ethan part-------	0-9	Loam-------------	CL, ML, CL-ML	A-4, A-6	0	95-100	90-100	80-95	55-80	25-40	5-20
	9-39	Loam, clay loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	55-80	30-45	10-25
	39-60	Loam, clay loam	CL-ML, CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	25-50	5-25
Houdek:											
HcB----------------	0-7	Stony loam-------	CL, CL-ML	A-4, A-6	3-20	95-100	90-100	85-100	60-85	25-40	5-15
	7-29	Clay loam--------	CL	A-6, A-7	3-20	95-100	90-100	85-100	60-80	30-50	10-25
	29-60	Clay loam, loam	CL	A-6, A-7	0-15	95-100	90-100	85-100	55-80	30-50	10-25
[1]HdB:											
Houdek part------	0-7	Loam-------------	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-85	25-40	5-20
	7-29	Clay loam--------	CL	A-6, A-7	0	95-100	95-100	85-100	60-80	30-50	10-25
	29-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-100	55-80	30-50	10-25
Dudley part------	0-9	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	65-90	25-40	5-20
	9-22	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0	95-100	95-100	85-100	65-95	35-60	15-35
	22-60	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-50	10-25
[1]HeB:											
Houdek part------	0-7	Loam-------------	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-85	25-40	5-20
	7-29	Clay loam--------	CL	A-6, A-7	0	95-100	95-100	85-100	60-80	30-50	10-25
	29-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-100	55-80	30-50	10-25
Ethan part-------	0-9	Loam-------------	CL, ML, CL-ML	A-4, A-6	0	95-100	90-100	80-95	55-80	25-40	5-20
	9-39	Loam, clay loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	55-80	30-45	10-25
	39-60	Loam, clay loam	CL-ML, CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	25-50	5-25
[1]HeC:											
Houdek part------	0-7	Loam-------------	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-85	25-40	5-20
	7-29	Clay loam--------	CL	A-6, A-7	0	95-100	95-100	85-100	60-80	30-50	10-25
	29-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-100	55-80	30-50	10-25

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	
Houdek:											
Ethan part	0-9	Loam	CL, ML, CL-ML	A-4, A-6	0	95-100	90-100	80-95	55-80	25-40	5-20
	9-39	Loam, clay loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	55-80	30-45	10-25
	39-60	Loam, clay loam	CL-ML, CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	25-50	5-25
[1]HoA:											
Houdek part	0-7	Loam	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-85	25-40	5-20
	7-29	Clay loam	CL	A-6, A-7	0	95-100	95-100	85-100	60-80	30-50	10-25
	29-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-100	55-80	30-50	10-25
Prosper part	0-10	Loam	CL, ML	A-4, A-6	0	95-100	95-100	85-100	60-90	30-40	8-20
	10-34	Clay loam, silty clay loam.	CL	A-6, A-7	0	95-100	95-100	85-100	60-90	35-50	10-25
	34-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-95	55-85	30-50	10-25
[1]HoB:											
Houdek part	0-7	Loam	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-85	25-40	5-20
	7-29	Clay loam	CL	A-6, A-7	0	95-100	95-100	85-100	60-80	30-50	10-25
	29-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-100	55-80	30-50	10-25
Prosper part	0-10	Loam	CL, ML	A-4, A-6	0	95-100	95-100	85-100	60-90	30-40	8-20
	10-34	Clay loam, silty clay loam.	CL	A-6, A-7	0	95-100	95-100	85-100	60-90	35-50	10-25
	34-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-95	55-85	30-50	10-25
Hoven:											
Hv	0-4	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	75-95	27-40	5-15
	4-34	Silty clay, clay, clay loam.	CH, MH	A-7	0	100	95-100	95-100	80-100	50-80	20-45
	34-60	Silty clay, clay, clay loam.	CL, CH	A-6, A-7	0	95-100	90-100	80-100	70-100	35-75	11-45
LaDelle:											
La	0-12	Silt loam	ML, CL	A-4, A-6, A-7	0	100	100	90-100	75-100	30-45	5-20
	12-60	Silt loam, silty clay loam, loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	75-100	25-45	5-20
Lamo:											
Lm	0-13	Silt loam	CL	A-6	0	100	100	95-100	85-95	20-35	10-20
	13-60	Silty clay loam, silt loam.	CL, CH, ML	A-7, A-6	0	100	100	95-100	85-95	35-60	10-35
Lane:											
LnA	0-8	Silt loam	CL	A-4, A-6, A-7	0	100	100	95-100	80-100	30-45	8-20
	8-24	Silty clay, clay, silty clay loam.	CL, CH, MH	A-7	0	100	95-100	90-100	75-95	45-65	15-35
	24-60	Silty clay, silty clay loam, clay loam.	CL, CH, MH	A-7	0	100	95-100	85-100	75-95	40-60	15-30
Loup:											
Lo	0-20	Loamy fine sand	SM	A-2	0	100	100	65-100	15-30	---	NP
	20-60	Fine sand	SP-SM, SM	A-2, A-3	0	100	100	65-100	5-20	---	NP

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	
Mobridge:											
Mo	0-14	Silt loam	ML, CL	A-6, A-4	0	100	95-100	90-100	70-100	30-40	5-15
	14-34	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	95-100	85-100	30-45	10-20
	34-60	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	95-100	95-100	85-100	30-45	10-20
Oko:											
OkB, OkD	0-5	Clay loam	CL	A-6, A-7	0	100	90-100	85-100	70-95	35-50	15-25
	5-60	Clay loam, clay	CL	A-7	0-5	95-100	90-100	75-100	65-95	40-65	20-40
Pits:											
Pg.											
Prosper:											
[1]PrA:											
Prosper part	0-10	Loam	CL, ML	A-4, A-6	0	95-100	95-100	85-100	60-90	30-40	8-20
	10-34	Clay loam, silty clay loam.	CL	A-6, A-7	0	95-100	95-100	85-100	60-90	35-50	10-25
	34-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-95	55-85	30-50	10-25
Davison part	0-7	Loam	CL-ML, CL	A-4, A-6	0	95-100	95-100	85-95	60-75	25-40	5-20
	7-23	Loam, clay loam	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	60-80	25-35	5-15
	23-34	Loam, clay loam	CL-ML, CL	A-4, A-6	0-5	95-100	95-100	85-100	60-80	25-40	5-20
	34-60	Stratified clay loam to sandy loam.	ML, CL, SM-SC, SC	A-4, A-6	0-5	90-100	80-100	65-95	40-75	20-35	5-15
Shue:											
Sh	0-10	Loamy fine sand	SM, SM-SC, SP-SM	A-2	0	100	95-100	50-85	5-35	<25	NP-5
	10-26	Loamy sand, loamy fine sand, fine sand.	SM, SM-SC, SP-SM	A-2, A-3	0	100	95-100	50-80	5-35	<25	NP-5
	26-60	Clay loam, loam	CL, CL-ML, ML	A-4, A-6, A-7	0-5	100	90-100	80-95	50-80	30-45	5-20
Spottswood:											
Sp	0-28	Loam, clay loam	CL-ML, CL, ML	A-7, A-6, A-4	0-5	100	95-100	75-95	50-75	28-48	5-22
	28-38	Gravelly sand	SM	A-2, A-4	0-5	90-100	90-100	50-80	25-40	---	NP
	38-60	Sand and gravel	SM, GM	A-2, A-1	0-5	40-80	25-75	15-70	13-30	---	NP
Stickney:											
[1]St:											
Stickney part	0-11	Silt loam	CL	A-4, A-6	0	100	95-100	85-95	60-90	30-40	8-15
	11-26	Clay loam, silty clay loam, clay.	CL, CH, MH	A-6, A-7	0	100	95-100	85-100	65-95	35-60	14-35
	26-60	Clay loam, loam	CL, CH, MH	A-6, A-7	0-5	95-100	90-100	80-100	55-90	35-55	10-30
Jerauld part	0-2	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	60-100	25-40	5-15
	2-11	Silty clay, clay, clay loam.	CH, MH, CL	A-7	0	100	95-100	90-100	75-95	45-70	20-45
	11-60	Silty clay, clay, clay loam.	CL, CH, MH	A-7	0	100	95-100	85-100	75-100	45-85	20-60

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	
Tetonka:											
Ta	0-8	Loamy fine sand	SM, SM-SC, SP-SM	A-2	0	100	95-100	50-80	10-35	<25	NP-5
	8-19	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	80-100	30-40	5-15
	19-44	Clay, silty clay	CL, CH, ML, MH	A-7	0	100	100	85-100	80-100	40-65	15-30
	44-60	Clay loam, clay	CL, CH, ML, MH	A-6, A-7	0	100	90-100	80-100	65-95	35-65	15-30
[1]Te:											
Tetonka part	0-14	Silt loam	ML, CL	A-4, A-6	0	100	100	95-100	80-100	27-40	5-15
	14-42	Clay, silty clay, clay loam.	CL, CH	A-6, A-7	0	100	95-100	85-100	65-100	35-65	15-40
	42-60	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	100	90-100	80-100	55-95	30-65	15-40
Hoven part	0-4	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	75-95	27-40	5-15
	4-34	Silty clay, clay, clay loam.	CH, MH	A-7	0	100	95-100	95-100	80-100	50-80	20-45
	34-60	Silty clay, clay, clay loam.	CL, CH	A-6, A-7	0	95-100	90-100	80-100	70-100	35-75	11-45
Zell:											
ZeC	0-6	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	95-100	85-100	80-100	25-40	5-15
	6-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	0	100	95-100	85-100	80-100	25-40	5-15

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole 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	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						
Beadle:											
BaA, BaB, BaC	0-7	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	Moderate	Low	0.28	5	6
	7-30	0.2-0.6	0.16-0.19	6.6-7.8	<2	High	High	Low	0.28		
	30-60	0.2-0.6	0.14-0.17	7.4-8.4	<2	High	High	Moderate	0.37		
[1]BdA:											
Beadle part	0-7	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	Moderate	Low	0.28	5	6
	7-30	0.2-0.6	0.16-0.19	6.6-7.8	<2	High	High	Low	0.28		
	30-60	0.2-0.6	0.14-0.17	7.4-8.4	<2	High	High	Moderate	0.37		
Dudley part	0-9	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	Moderate	Low	0.43	3	6
	9-22	<0.2	0.13-0.19	6.6-9.0	4-16	High	High	Moderate	0.32		
	22-60	0.06-0.6	0.13-0.20	7.4-9.0	8-16	Moderate	High	High	0.32		
Betts:											
BeD	0-9	0.6-2.0	0.16-0.18	6.6-8.4	<2	Moderate	Moderate	Low	0.28	5	8
	9-27	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	High	Moderate	0.37		
	27-60	0.2-0.6	0.17-0.20	7.4-8.4	2-8	Moderate	High	Moderate	0.37		
[1]BfD:											
Betts part	0-9	0.6-2.0	0.16-0.18	6.6-8.4	<2	Moderate	Moderate	Moderate	0.28	5	4L
	9-27	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	High	Moderate	0.37		
	27-60	0.2-0.6	0.17-0.20	7.4-8.4	2-8	Moderate	High	Moderate	0.37		
Ethan part	0-9	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	Moderate	Low	0.28	5	6
	9-39	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	Moderate	Low	0.37		
	39-60	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	High	Moderate	0.37		
Blendon:											
BnA	0-10	2.0-6.0	0.11-0.17	5.6-7.3	<2	Low	Moderate	Low	0.20	5	3
	10-32	2.0-6.0	0.11-0.17	6.1-7.3	<2	Low	Moderate	Low	0.20		
	32-60	2.0-20	0.08-0.15	6.6-8.4	<2	Low	Moderate	Low	0.20		
Bon:											
Bo, Bx	0-31	0.6-2.0	0.18-0.20	6.6-8.4	<2	Low	Low	Low	0.24	5	6
	31-60	0.6-2.0	0.08-0.18	7.9-8.4	<2	Low	Moderate	Low	0.32		
Carthage:											
CaA, CaB, CaC	0-8	2.0-6.0	0.11-0.17	6.1-7.3	<2	Low	Moderate	Low	0.20	5	3
	8-32	2.0-6.0	0.08-0.17	6.1-8.4	<2	Low	Moderate	Low	0.20		
	32-60	0.2-0.6	0.16-0.20	7.4-8.4	<2	Moderate	High	Moderate	0.37		
[1]CbA:											
Carthage part	0-8	2.0-6.0	0.11-0.17	6.1-7.3	<2	Low	Moderate	Low	0.20	5	3
	8-32	2.0-6.0	0.08-0.17	6.1-8.4	<2	Low	Moderate	Low	0.20		
	32-60	0.2-0.6	0.16-0.20	7.4-8.4	<2	Moderate	High	Moderate	0.37		
Blendon part	0-10	2.0-6.0	0.11-0.17	5.6-7.3	<2	Low	Moderate	Low	0.20	5	3
	10-32	2.0-6.0	0.11-0.17	6.1-7.3	<2	Low	Moderate	Low	0.20		
	32-60	2.0-20	0.08-0.15	6.6-8.4	<2	Low	Moderate	Low	0.20		
[1]CbB:											
Carthage part	0-8	2.0-6.0	0.11-0.17	6.1-7.3	<2	Low	Moderate	Low	0.20	5	3
	8-32	2.0-6.0	0.08-0.17	6.1-8.4	<2	Low	Moderate	Low	0.20		
	32-60	0.2-0.6	0.16-0.20	7.4-8.4	<2	Moderate	High	Moderate	0.37		
Blendon part	0-10	2.0-6.0	0.11-0.17	5.6-7.3	<2	Low	Moderate	Low	0.20	5	3
	10-32	2.0-6.0	0.11-0.17	6.1-7.3	<2	Low	Moderate	Low	0.20		
	32-60	2.0-20	0.08-0.15	6.6-8.4	<2	Low	Moderate	Low	0.20		
Davis:											
DaB	0-8	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	Moderate	Low	0.24	5	6
	8-30	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	Moderate	Low	0.24		
	30-60	0.6-2.0	0.18-0.20	6.6-8.4	<2	Moderate	Moderate	Low	0.37		

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						
Delmont:											
DeA	0-7	0.6-2.0	0.18-0.20	6.6-7.8	<2	Low	Low	Low	0.28	3	6
	7-16	0.6-6.0	0.12-0.18	6.6-7.8	<2	Low	Moderate	Low	0.28		
	16-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low	Moderate	Low	0.10		
[1]DfB:											
Delmont part	0-7	0.6-2.0	0.18-0.20	6.6-7.8	<2	Low	Low	Low	0.28	3	6
	7-16	0.6-6.0	0.12-0.18	6.6-7.8	<2	Low	Moderate	Low	0.28		
	16-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low	Moderate	Low	0.10		
Talmo part	0-7	0.6-2.0	0.11-0.20	6.6-7.8	<2	Low	Moderate	Low	0.20	2	---
	7-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low	Moderate	Low	0.10		
Doger:											
Dg	0-24	6.0-20	0.08-0.12	6.1-7.8	<2	Low	Low	Low	0.17	5	2
	24-60	6.0-20	0.06-0.10	6.1-7.8	<2	Low	Low	Low	0.17		
Dudley:											
[1]DkA:											
Dudley part	0-9	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	Moderate	Low	0.43	3	6
	9-22	<0.2	0.13-0.19	6.6-9.0	4-16	High	High	Moderate	0.32		
	22-60	0.06-0.6	0.13-0.20	7.4-9.0	8-16	Moderate	High	High	0.32		
Jerauld part	0-2	0.6-2.0	0.18-0.22	5.6-7.3	<4	Moderate	Moderate	Low	0.43	2	8
	2-11	<0.2	0.10-0.15	6.6-9.0	<4	High	High	Moderate	0.32		
	11-60	<0.2	0.08-0.13	7.4-9.0	>4	High	High	Moderate	0.32		
[1]DsA:											
Dudley part	0-9	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	Moderate	Low	0.43	3	6
	9-22	<0.2	0.13-0.19	6.6-9.0	4-16	High	High	Moderate	0.32		
	22-60	0.06-0.6	0.13-0.20	7.4-9.0	8-16	Moderate	High	High	0.32		
Stickney part	0-11	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	Moderate	Low	0.37	3	6
	11-26	0.06-0.2	0.16-0.19	6.1-7.8	4-12	High	High	Moderate	0.37		
	26-60	0.06-0.6	0.14-0.18	7.4-8.4	>4	High	High	High	0.37		
[1]DtA:											
Dudley part	0-9	0.6-2.0	0.18-0.22	5.6-7.3	<2	Moderate	Moderate	Low	0.43	3	6
	9-22	<0.2	0.13-0.19	6.1-8.4	4-16	High	High	Moderate	0.32		
	22-60	0.06-0.6	0.13-0.20	7.4-9.0	8-16	Moderate	High	High	0.32		
Tetonka part	0-14	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	Moderate	Moderate	0.24	3	6
	14-42	<0.06	0.13-0.19	6.1-7.8	<2	High	High	Moderate	0.32		
	42-60	0.06-0.6	0.11-0.17	7.4-8.4	2-8	High	High	Moderate	0.32		
Durrstein:											
Du	0-4	0.6-2.0	0.17-0.20	6.1-7.3	4-16	Low	High	High	0.37	1	8
	4-20	<0.2	0.10-0.15	6.6-8.4	4-16	High	High	High	0.28		
	20-60	<0.2	0.08-0.13	7.4-8.4	4-16	High	High	High	0.28		
Egas:											
Eg	0-3	0.06-0.2	0.10-0.15	7.4-9.0	>8	High	High	Moderate	0.28	5	8
	3-60	0.06-0.2	0.08-0.13	7.9-9.0	>8	High	High	Moderate	0.28		
Elsmere:											
Em	0-24	6.0-20	0.10-0.12	5.6-7.8	<2	Low	Moderate	Low	0.17	5	2
	24-44	6.0-20	0.08-0.10	5.6-7.8	<2	Low	Moderate	Low	0.17		
	44-60	0.2-0.6	0.12-0.20	7.4-8.4	<2	Moderate	High	Moderate	0.28		
Enet:											
EnA, EnB	0-22	0.6-2.0	0.18-0.20	6.1-7.3	<2	Low	Low	Low	0.28	4	6
	22-25	0.6-2.0	0.11-0.20	6.6-7.8	<2	Low	Moderate	Low	0.28		
	25-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low	Moderate	Low	0.10		

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						
Forestburg:											
FoA, FoB	0-6	6.0-20	0.10-0.12	6.1-7.3	<2	Low	Low	Low	0.17	5	2
	6-29	6.0-20	0.08-0.10	6.6-7.3	<2	Low	Moderate	Low	0.17		
	29-50	0.2-0.6	0.17-0.20	7.4-8.4	<2	Moderate	Moderate	Moderate	0.37		
	50-60	0.2-0.6	0.08-0.18	7.4-8.4	<2	Low	Moderate	Moderate	0.37		
[1]FrA:											
Forestburg part	0-6	6.0-20	0.10-0.12	6.1-7.3	<2	Low	Low	Low	0.17	5	2
	6-29	6.0-20	0.08-0.10	6.6-7.3	<2	Low	Moderate	Low	0.17		
	29-50	0.2-0.6	0.17-0.20	7.4-8.4	<2	Moderate	Moderate	Moderate	0.37		
	50-60	0.2-0.6	0.08-0.18	7.4-8.4	<2	Low	Moderate	Moderate	0.37		
Doger part	0-11	6.0-20	0.08-0.12	6.1-7.8	<2	Low	Low	Low	0.17	5	2
	11-60	6.0-20	0.06-0.10	6.1-7.8	<2	Low	Low	Low	0.17		
[1]FrB:											
Forestburg part	0-6	6.0-20	0.10-0.12	6.1-7.3	<2	Low	Low	Low	0.17	5	2
	6-29	6.0-20	0.08-0.10	6.6-7.3	<2	Low	Moderate	Low	0.17		
	29-50	0.2-0.6	0.17-0.20	7.4-8.4	<2	Moderate	Moderate	Moderate	0.37		
	50-60	0.2-0.6	0.08-0.18	7.4-8.4	<2	Low	Moderate	Moderate	0.37		
Doger part	0-11	6.0-20	0.08-0.12	6.1-7.8	<2	Low	Low	Low	0.17	5	2
	11-60	6.0-20	0.06-0.10	6.1-7.8	<2	Low	Low	Low	0.17		
Grat:											
Ga	0-5	0.6-2.0	0.18-0.20	6.1-7.3	<2	Moderate	High	Low	0.32	5	6
	5-31	0.06-0.2	0.13-0.19	6.6-8.4	<4	High	High	Moderate	0.32		
	31-55	6.0-20	0.03-0.06	7.4-8.4	<2	Low	High	Moderate	0.10		
	55-60	0.2-0.6	0.16-0.20	7.4-8.4	<2	Moderate	High	Moderate	0.28		
Great Bend:											
GbA	0-6	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	Moderate	Low	0.32	5	6
	6-20	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	Moderate	Low	0.43		
	20-60	0.2-2.0	0.17-0.20	7.4-9.0	2-4	Moderate	High	Moderate	0.43		
[1]GzB:											
Great Bend part	0-6	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	Moderate	Low	0.32	5	6
	6-20	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	Moderate	Low	0.43		
	20-60	0.2-2.0	0.17-0.20	7.4-9.0	2-4	Moderate	High	Moderate	0.43		
Zell part	0-6	0.6-2.0	0.17-0.22	6.6-8.4	<2	Low	High	Low	0.32	5	4L
	6-60	0.6-2.0	0.15-0.20	7.4-8.4	<2	Low	High	Moderate	0.43		
Hand:											
[1]HaA:											
Hand part	0-18	0.6-2.0	0.18-0.20	5.6-7.3	<2	Moderate	Moderate	Low	0.28	5-4	6
	18-29	0.6-2.0	0.18-0.22	6.1-8.4	<2	Moderate	Moderate	Low	0.28		
	29-60	0.6-2.0	0.12-0.18	7.4-8.4	2-8	Moderate	High	Low	0.43		
Bonilla part	0-9	0.6-2.0	0.18-0.20	5.6-7.3	<2	Low	Moderate	Low	0.24	5	6
	9-23	0.6-2.0	0.18-0.22	6.1-7.8	<2	Moderate	Moderate	Low	0.24		
	23-38	0.6-2.0	0.16-0.20	7.4-8.4	2-8	Moderate	High	Low	0.43		
	38-60	0.2-2.0	0.12-0.18	7.4-8.4	2-8	Moderate	High	Moderate	0.43		
[1]HaB:											
Hand part	0-18	0.6-2.0	0.18-0.20	5.6-7.3	<2	Moderate	Moderate	Low	0.28	5	6
	18-29	0.6-2.0	0.18-0.22	6.1-8.4	<2	Moderate	Moderate	Low	0.28		
	29-60	0.6-2.0	0.12-0.18	7.4-8.4	2-8	Moderate	High	Low	0.43		
Bonilla part	0-9	0.6-2.0	0.18-0.20	5.6-7.3	<2	Low	Moderate	Low	0.24	5	6
	9-23	0.6-2.0	0.18-0.22	6.1-7.8	<2	Moderate	Moderate	Low	0.24		
	23-38	0.6-2.0	0.16-0.20	7.4-8.4	2-8	Moderate	High	Low	0.43		
	38-60	0.2-2.0	0.12-0.18	7.4-8.4	2-8	Moderate	High	Moderate	0.43		
[1]HbC:											
Hand part	0-18	0.6-2.0	0.18-0.20	5.6-7.3	<2	Moderate	Moderate	Low	0.28	5	6
	18-29	0.6-2.0	0.18-0.22	6.1-8.4	<2	Moderate	Moderate	Low	0.28		
	29-60	0.6-2.0	0.12-0.18	7.4-8.4	2-8	Moderate	High	Low	0.43		

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						
Hand:											
Ethan part-------	0-9	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	Moderate	Low-------	0.28	5	6
	9-39	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	Moderate	Low-------	0.37		
	39-60	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	High------	Moderate	0.37		
Houdek:											
HcB----------------	0-7	0.6-2.0	0.18-0.20	6.1-7.3	<2	Moderate	Moderate	Low-------	0.20	5	8
	7-29	0.6-2.0	0.17-0.22	6.6-7.8	<2	Moderate	Moderate	Low-------	0.28		
	29-60	0.2-0.6	0.16-0.20	7.4-8.4	<4	Moderate	High------	Moderate	0.37		
[1]HdB:											
Houdek part------	0-7	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	Moderate	Low-------	0.28	5	6
	7-29	0.6-2.0	0.16-0.22	6.6-7.8	<2	Moderate	Moderate	Low-------	0.28		
	29-60	0.2-0.6	0.17-0.20	7.4-8.4	<8	Moderate	High------	Moderate	0.37		
Dudley part------	0-9	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	Moderate	Low-------	0.43	3	6
	9-22	<0.2	0.13-0.19	6.6-9.0	4-16	High-------	High------	Moderate	0.32		
	22-60	0.06-0.6	0.13-0.20	7.4-9.0	8-16	Moderate	High------	High------	0.32		
[1]HeB:											
Houdek part------	0-7	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	Moderate	Low-------	0.28	5	6
	7-29	0.6-2.0	0.16-0.22	6.6-7.8	<2	Moderate	Moderate	Low-------	0.28		
	29-60	0.2-0.6	0.17-0.20	7.4-8.4	<8	Moderate	High------	Moderate	0.37		
Ethan part-------	0-9	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	Moderate	Low-------	0.28	5	6
	9-39	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	Moderate	Low-------	0.37		
	39-60	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	High------	Moderate	0.37		
[1]HeC:											
Houdek part------	0-7	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	Moderate	Low-------	0.28	5	6
	7-29	0.6-2.0	0.16-0.22	6.6-7.8	<2	Moderate	Moderate	Low-------	0.28		
	29-60	0.2-0.6	0.17-0.20	7.4-8.4	<8	Moderate	High------	Moderate	0.37		
Ethan part-------	0-9	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	Moderate	Low-------	0.28	5	6
	9-39	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	Moderate	Low-------	0.37		
	39-60	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	High------	Moderate	0.37		
[1]HoA:											
Houdek part------	0-7	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	Moderate	Low-------	0.28	5	6
	7-29	0.6-2.0	0.16-0.22	6.6-7.8	<2	Moderate	Moderate	Low-------	0.28		
	29-60	0.2-0.6	0.17-0.20	7.4-8.4	<8	Moderate	High------	Moderate	0.37		
Prosper part-----	0-10	0.6-2.0	0.18-0.22	6.1-7.8	<2	Moderate	Moderate	Low-------	0.28	5	6
	10-34	0.6-2.0	0.19-0.22	6.6-8.4	<2	Moderate	Moderate	Low-------	0.28		
	34-60	0.2-0.6	0.17-0.20	7.4-8.4	2-8	Moderate	High------	Moderate	0.37		
[1]HoB:											
Houdek part------	0-7	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	Moderate	Low-------	0.28	5	6
	7-29	0.6-2.0	0.16-0.22	6.6-7.8	<2	Moderate	Moderate	Low-------	0.28		
	29-60	0.2-0.6	0.17-0.20	7.4-8.4	<8	Moderate	High------	Moderate	0.37		
Prosper part-----	0-10	0.6-2.0	0.18-0.22	6.1-7.8	<2	Moderate	Moderate	Low-------	0.28	5	6
	10-34	0.6-2.0	0.19-0.22	6.6-8.4	<2	Moderate	Moderate	Low-------	0.28		
	34-60	0.2-0.6	0.17-0.20	7.4-8.4	2-8	Moderate	High------	Moderate	0.37		
Hoven:											
Hv-----------------	0-4	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	Moderate	Moderate	0.37	1	8
	4-34	<0.06	0.10-0.19	6.1-8.4	<2	High-------	High------	Moderate	0.28		
	34-60	<0.2	0.08-0.17	7.4-9.0	<2	High-------	High------	Moderate	0.28		
LaDelle:											
La-----------------	0-12	0.6-2.0	0.18-0.22	6.6-7.8	<2	Moderate	Moderate	Low-------	0.28	5	6
	12-60	0.6-2.0	0.18-0.22	7.4-8.4	<2	Moderate	High------	Low-------	0.28		
Lamo:											
Lm-----------------	0-13	0.6-2.0	0.22-0.24	7.4-8.4	<2	Moderate	High------	Low-------	0.28	5	6
	13-60	0.2-0.6	0.18-0.20	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	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						
Lane:											
LnA----------------	0-8	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	Moderate	Low------	0.28	5	6
	8-24	0.06-0.6	0.13-0.19	6.6-7.8	<2	High------	High-----	Low------	0.28		
	24-60	0.06-0.6	0.11-0.20	7.4-8.4	>4	High------	High-----	Moderate	0.37		
Loup:											
Lo-----------------	0-20	6.0-20	0.10-0.14	6.6-8.4	<2	Low-------	High-----	Low------	0.17	5	2
	20-60	6.0-20	0.06-0.08	7.4-8.4	<2	Low-------	High-----	Low------	0.17		
Mobridge:											
Mo-----------------	0-14	0.6-2.0	0.19-0.22	6.1-7.3	<2	Low-------	Moderate	Low------	0.32	5	6
	14-34	0.6-2.0	0.19-0.22	6.6-7.8	<2	Moderate	High-----	Low------	0.32		
	34-60	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	High-----	Low------	0.43		
Oko:											
OkB, OkD----------	0-5	0.2-0.6	0.19-0.22	6.6-7.8	<2	Moderate	Moderate	Low------	0.28	3-2	7
	5-60	0.06-0.2	0.11-0.17	7.4-8.4	<2	High------	High-----	Moderate	0.28		
Pits:											
Pg.											
Prosper:											
[1]PrA:											
Prosper part----	0-10	0.6-2.0	0.18-0.22	6.1-7.8	<2	Moderate	Moderate	Low------	0.28	5	6
	10-34	0.6-2.0	0.19-0.22	6.6-8.4	<2	Moderate	Moderate	Low------	0.28		
	34-60	0.2-0.6	0.17-0.20	7.4-8.4	2-8	Moderate	High-----	Moderate	0.37		
Davison part----	0-7	0.6-2.0	0.18-0.20	6.6-8.4	<2	Moderate	Moderate	Low------	0.28	5	4L
	7-23	0.6-2.0	0.13-0.17	7.9-9.0	<2	Moderate	High-----	Low------	0.37		
	23-34	0.6-2.0	0.16-0.20	7.4-8.4	2-8	Moderate	High-----	Moderate	0.37		
	34-60	0.6-2.0	0.10-0.18	7.4-8.4	2-8	Moderate	High-----	Moderate	0.37		
Shue:											
Sh-----------------	0-10	6.0-20	0.10-0.12	6.6-7.8	<2	Low-------	Moderate	Low------	0.17	4	2
	10-26	6.0-20	0.06-0.10	6.6-7.8	<2	Low-------	Moderate	Low------	0.17		
	26-60	0.2-0.6	0.16-0.20	7.4-8.4	<4	Moderate	High-----	Moderate	0.28		
Spottswood:											
Sp-----------------	0-28	0.6-2.0	0.19-0.22	6.1-8.4	<2	Low-------	Moderate	Low------	0.24	4	6
	28-38	6.0-20	0.08-0.10	7.4-8.4	<2	Low-------	High-----	Low------	0.10		
	38-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low-------	High-----	Low------	0.10		
Stickney:											
[1]St:											
Stickney part---	0-11	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	Moderate	Low------	0.37	3	6
	11-26	0.06-0.2	0.16-0.19	6.1-7.8	4-12	High------	High-----	Moderate	0.37		
	26-60	0.06-0.6	0.14-0.18	7.4-8.4	>4	High------	High-----	High-----	0.37		
Jerauld part----	0-2	0.6-2.0	0.18-0.22	5.6-7.3	<4	Moderate	Moderate	Low------	0.43	2	8
	2-11	<0.2	0.10-0.15	6.6-9.0	<4	High------	High-----	Moderate	0.32		
	11-60	<0.2	0.08-0.13	7.4-9.0	>4	High------	High-----	Moderate	0.32		
Tetonka:											
Ta-----------------	0-8	6.0-20	0.10-0.12	5.6-7.3	<2	Low-------	Moderate	Low------	0.17	3	2
	8-19	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	Moderate	Low------	0.28		
	19-44	<0.06	0.10-0.16	6.1-7.8	<2	High------	High-----	Moderate	0.28		
	44-60	0.06-0.6	0.11-0.17	7.4-8.4	<4	High------	High-----	Moderate	0.28		
[1]Te:											
Tetonka part----	0-14	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	Moderate	Moderate	0.24	3	6
	14-42	<0.06	0.13-0.19	6.1-7.8	<2	High------	High-----	Moderate	0.32		
	42-60	0.06-0.6	0.11-0.17	7.4-8.4	2-8	High------	High-----	Moderate	0.32		
Hoven part------	0-4	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	Moderate	Moderate	0.37	1	8
	4-34	<0.06	0.10-0.19	6.1-8.4	<2	High------	High-----	Moderate	0.28		
	34-60	<0.2	0.08-0.17	7.4-9.0	<2	High------	High-----	Moderate	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: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodi- bility group
	In	In/hr	In/in	pH	Mmhos/cm						
Zell:											
ZeC----------------	0-6	0.6-2.0	0.17-0.22	6.6-8.4	<2	Low--------	High-----	Low------	0.32	5	4L
	6-60	0.6-2.0	0.15-0.20	7.4-8.4	<2	Low--------	High-----	Moderate	0.43		

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See text for descriptions of symbols and such terms as "rare," "brief," and "perched." The symbol < means less than; > means greater than]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	
					Ft			
Beadle:								
BaA, BaB, BaC	C	None	---	---	>6.0	---	---	Low.
[1]BdA:								
Beadle part	C	None	---	---	>6.0	---	---	Low.
Dudley part	D	None	---	---	>6.0	---	---	Moderate.
Betts:								
BeD	B	None	---	---	>6.0	---	---	Moderate.
[1]BfD:								
Betts part	B	None	---	---	>6.0	---	---	Moderate.
Ethan part	B	None	---	---	>6.0	---	---	Moderate.
Blendon:								
BnA	B	None	---	---	>6.0	---	---	Moderate.
Bon:								
Bo, Bx	B	Common	Brief	Apr-Oct	>6.0	---	---	Moderate.
Carthage:								
CaA, CaB, CaC	B	None	---	---	2.0-4.0	Perched	Mar-Jun	Moderate.
[1]CbA:								
Carthage part	B	None	---	---	2.0-4.0	Perched	Mar-Jun	Moderate.
Blendon part	B	None	---	---	>6.0	---	---	Moderate.
[1]CbB:								
Carthage part	B	None	---	---	2.0-4.0	Perched	Mar-Jun	Moderate.
Blendon part	B	None	---	---	>6.0	---	---	Moderate.
Davis:								
DaB	B	None	---	---	>6.0	---	---	Moderate.
Delmont:								
DeA	B	None	---	---	>6.0	---	---	Low.
[1]DfB:								
Delmont part	B	None	---	---	>6.0	---	---	Low.
Talmo part	A	None	---	---	>6.0	---	---	Low.
Doger:								
Dg	A	None	---	---	>6.0	---	---	Low.
Dudley:								
[1]DkA:								
Dudley part	D	None	---	---	>6.0	---	---	Moderate.
Jerauld part	D	None	---	---	>6.0	---	---	Low.
[1]DsA:								
Dudley part	D	None	---	---	>6.0	---	---	Moderate.
Stickney part	C	None	---	---	>6.0	---	---	Moderate.
[1]DtA:								
Dudley part	D	Rare	---	---	>6.0	---	---	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			Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	
					Ft			
Dudley:								
Tetonka part	C/D	Common	Very long	Jan-Dec	0-5.0	Perched	Jan-Dec	High.
Durrstein:								
Du	D	Common	Brief	Apr-Oct	0-1.0	Apparent	Oct-Jun	Moderate.
Egas:								
Eg	D	Common	Brief	Apr-Oct	0-1.0	Apparent	Oct-Jun	High.
Elsmere:								
Em	A	None	---	---	2.0-5.0	Perched	Mar-Jul	High.
Enet:								
EnA, EnB	B	None	---	---	>6.0	---	---	Low.
Forestburg:								
FoA, FoB	A	None	---	---	2.0-4.0	Perched	Mar-Jun	Moderate.
[1]FrA:								
Forestburg part	A	None	---	---	2.0-4.0	Perched	Mar-Jun	Moderate.
Doger part	A	None	---	---	>6.0	---	---	Low.
[1]FrB:								
Forestburg part	A	None	---	---	2.0-4.0	Perched	Mar-Jun	Moderate.
Doger part	A	None	---	---	>6.0	---	---	Low.
Grat:								
Ga	D	Occasional	Brief	Mar-Oct	2.0-5.0	Apparent	Oct-Jun	High.
Great Bend:								
GbA	B	None	---	---	>6.0	---	---	High.
[1]GzB:								
Great Bend part	B	None	---	---	>6.0	---	---	High.
Zell part	B	None	---	---	>6.0	---	---	High.
Hand:								
[1]HaA:								
Hand part	B	None	---	---	>6.0	---	---	Moderate.
Bonilla part	B	Common	Very brief	Apr-Oct	4.0-6.0	Perched	Oct-Jun	Moderate.
[1]HaB:								
Hand part	B	None	---	---	>6.0	---	---	Moderate.
Bonilla part	B	None	---	---	4.0-6.0	Perched	Oct-Jun	Moderate.
[1]HbC:								
Hand part	B	None	---	---	>6.0	---	---	Moderate.
Ethan part	B	None	---	---	>6.0	---	---	Moderate.
Houdek:								
HcB	B	None	---	---	>6.0	---	---	Moderate.
[1]HdB:								
Houdek part	B	None	---	---	>6.0	---	---	Moderate.
Dudley part	D	None	---	---	>6.0	---	---	Moderate.
[1]HeB:								
Houdek part	B	None	---	---	>6.0	---	---	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	
					Ft			
Houdek:								
Ethan part	B	None	---	---	>6.0	---	---	Moderate.
[1]HeC:								
Houdek part	B	None	---	---	>6.0	---	---	Moderate.
Ethan part	B	None	---	---	>6.0	---	---	Moderate.
[1]HoA:								
Houdek part	B	None	---	---	>6.0	---	---	Moderate.
Prosper part	B	Common	Very brief	Oct-Jun	3.0-6.0	Perched	Oct-Jun	Moderate.
[1]HoB:								
Houdek part	B	None	---	---	>6.0	---	---	Moderate.
Prosper part	B	None	---	---	3.0-6.0	Perched	Oct-Jun	Moderate.
Hoven:								
Hv	D	Common	Very long	Sep-Jul	+.5-1.0	Perched	Oct-Jun	Moderate.
Ladelle:								
La	B	Rare to common.	Brief	Apr-Jun	4.0-6.0	Apparent	Oct-Jun	High.
Lamo:								
Lm	C	Occasional	Brief	Mar-Aug	2.0-6.0	Apparent	Nov-May	High.
Lane:								
LnA	C	None	---	---	>6.0	---	---	Low.
Loup:								
Lo	D	Rare	---	---	0-1.0	Apparent	Mar-Jul	Moderate.
Mobridge:								
Mo	B	None to common.	Very brief	Oct-Jun	>6.0	---	---	Moderate.
Oko:								
OkB, OkD	D	None	---	---	>6.0	---	---	Low.
Pits:								
Pg.								
Prosper:								
[1]PrA:								
Prosper part	B	Common	Very brief	Oct-Jun	3.0-6.0	Perched	Oct-Jun	Moderate.
Davison part	B	None	---	---	1.5-6.0	Perched	Mar-Jun	High.
Shue:								
Sh	C	Rare	---	---	1.0-3.0	Perched	Mar-Jun	Moderate.
Spottswood:								
Sp	B	None	---	---	3.0-6.0	Apparent	Oct-Jun	Moderate.
Stickney:								
[1]St:								
Stickney part	C	None	---	---	>6.0	---	---	Moderate.
Jerauld part	D	None	---	---	>6.0	---	---	Low.
Tetonka:								
Ta	C/D	Common	Very long	Jan-Dec	0-1.0	Perched	Jan-Dec	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			Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	
					Ft			
Tetonka:								
[1]Te:								
Tetonka part---	C/D	Common-------	Very long	Jan-Dec	0-1.0	Perched	Jan-Dec	High.
Hoven part-----	D	Common-------	Very long	Sep-Jul	+.5-1.0	---	---	Moderate.
Zell:								
ZeC-------------	B	None---------	---	---	>6.0	---	---	High.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 17.--ENGINEERING TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

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	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
Beadle loam (S74SD-005-042)															
A1------ 00 to 07	A-7-5(12)	ML	100	100	99	98	92	78	--	24	--	46	14	89	28
B21t---- 07 to 17	A-7-6(09)	CL	100	97	93	89	79	59	--	30	--	44	18	100	22
B3ca---- 17 to 30	A-7-5(14)	ML	100	100	99	98	91	72	--	44	--	49	19	97	23
C1ca---- 30 to 60	A-7-6(15)	MH	100	98	97	95	83	66	--	41	--	53	24	100	22
Carthage fine sandy loam (S74SD-005-020)															
Ap------ 00 to 20	A-2-4(00)	SM	100	100	100	100	98	25	--	12	--	20	NP	116	14
B2------ 20 to 32	A-2-4(00)	SM-SC	100	100	100	100	96	34	--	14	--	21	4	116	14
IIC2---- 32 to 40	A-6 (08)	CL	100	100	98	95	84	60	--	37	--	38	17	112	16
Doger loamy fine sand (S74SD-005-022)															
Ap------ 00 to 11	A-4 (00)	SM	100	100	100	100	97	42	--	17	--	27	4	104	20
AC1----- 11 to 24	A-2-4(00)	SM	100	100	100	100	98	26	--	13	--	20	NP	117	14
C1------ 24 to 60	A-2-4(00)	SW-SM	100	100	100	100	98	11	--	9	--	21	NP	107	18
Forestburg loamy fine sand (S74SD-005-016)															
Ap------ 00 to 11	A-2-4(00)	SM	100	99	98	98	91	24	--	14	--	22	NP	116	14
AC------ 11 to 31	A-2-4(00)	SM	100	100	100	100	97	26	--	11	--	19	NP	116	14
IIC2---- 31 to 60	A-6 (07)	CL	100	98	97	96	88	63	--	26	--	31	14	111	16

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Beadle	Fine, montmorillonitic, mesic Typic Argiustolls
Betts	Fine-loamy, mixed (calcareous), mesic Typic Ustorthents
Blendon	Coarse-loamy, mixed, mesic Pachic Haplustolls
Bon	Fine-loamy, mixed, mesic Cumulic Haplustolls
Bonilla	Fine-loamy, mixed, mesic Pachic Haplustolls
Carthage	Coarse-loamy, mixed, mesic Pachic Haplustolls
Davis	Fine-loamy, mixed, mesic Pachic Haplustolls
Davison	Fine-loamy, mesic Aeric Calciaquolls
Delmont	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Haplustolls
Doger	Sandy, mixed, mesic Entic Haplustolls
Dudley	Fine, montmorillonitic, mesic Typic Natrustolls
Durrstein	Fine, montmorillonitic, mesic Typic Natraquolls
Egas	Fine, montmorillonitic (calcareous), mesic Typic Haplaquolls
Elsmere	Sandy, mixed, mesic Aquic Haplustolls
Enet	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Pachic Haplustolls
Ethan	Fine-loamy, mixed, mesic Entic Haplustolls
Forestburg	Sandy over loamy, mixed, mesic Entic Haplustolls
Grat	Clayey over sandy or sandy-skeletal, montmorillonitic, mesic Typic Argiaquolls
Great Bend	Fine-silty, mixed Udic Haploborolls
Hand	Fine-loamy, mixed, mesic Typic Haplustolls
Houdek	Fine-loamy, mixed, mesic Typic Argiustolls
Hoven	Fine, montmorillonitic, mesic Typic Natraquolls
Jerauld	Fine, montmorillonitic, mesic Leptic Natrustolls
LaDelle	Fine-silty, mixed Cumulic Udic Haploborolls
Lamo	Fine-silty, mixed (calcareous), mesic Cumulic Haplaquolls
Lane	Fine, montmorillonitic, mesic Pachic Argiustolls
Loup	Sandy, mixed, mesic Typic Haplaquolls
Mobridge	Fine-silty, mixed, mesic Pachic Argiustolls
Oko	Fine, montmorillonitic, mesic Vertic Argiustolls
Prosper	Fine-loamy, mixed, mesic Pachic Argiustolls
Shue	Sandy over loamy, mixed, mesic Aquic Haplustolls
Spottswood	Fine-loamy over sandy or sandy-skeletal, mixed Pachic Udic Haploborolls
Stickney	Fine, montmorillonitic, mesic Glossic Natrustolls
Talmo	Sandy-skeletal, mixed, mesic Udorthentic Haplustolls
Tetonka	Fine, montmorillonitic, mesic Argiaquic Argialbolls
Zell	Coarse-silty, mixed Udorthentic Haploborolls

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