

SOIL SURVEY OF
Beadle County, South Dakota



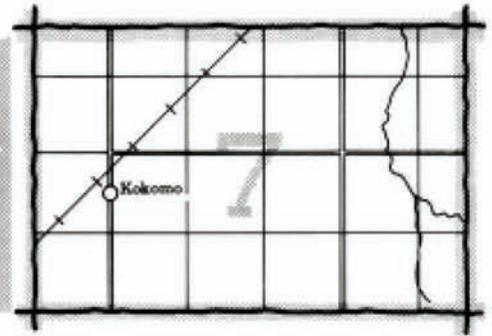
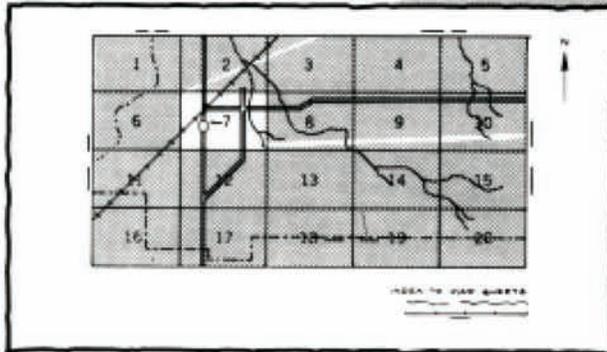
United States Department of Agriculture
Soil Conservation Service

in cooperation with

South Dakota Agricultural Experiment Station

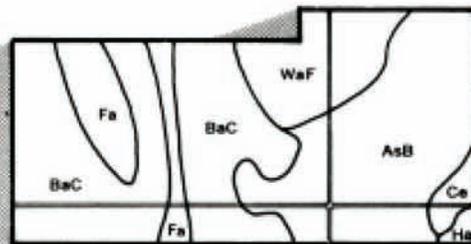
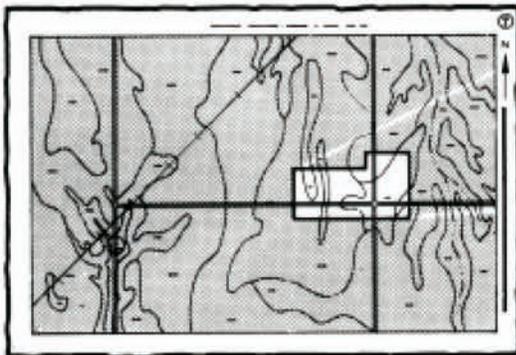
HOW TO USE

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

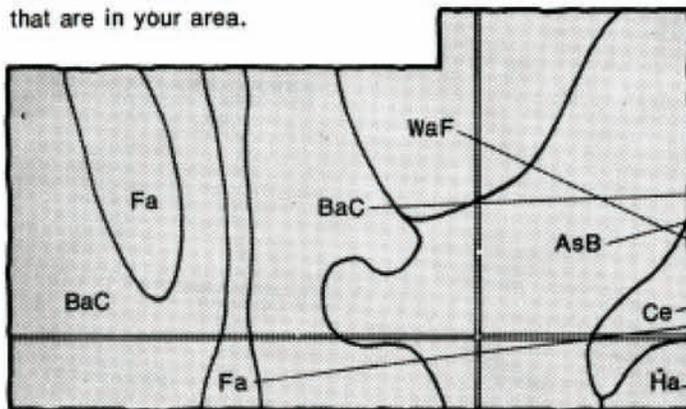


2. Note the number of the map sheet and turn to that sheet.

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



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

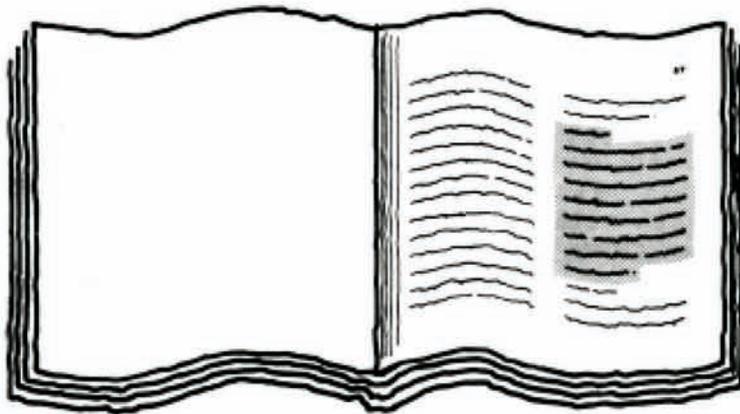


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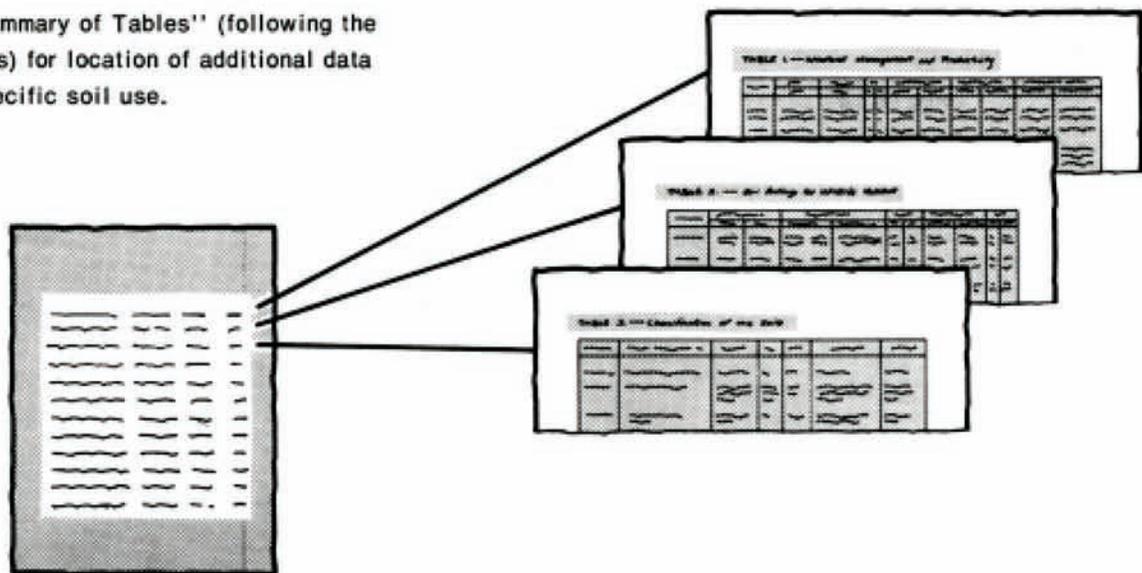
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THIS SOIL SURVEY

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.

A detailed view of a table from the 'Index to Soil Map Units'. The table has multiple columns and rows, listing map units and their corresponding page numbers. The text is small and difficult to read, but the structure is clear.

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



Consult "Contents" for parts of the publication that will meet your specific needs.

7. 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.

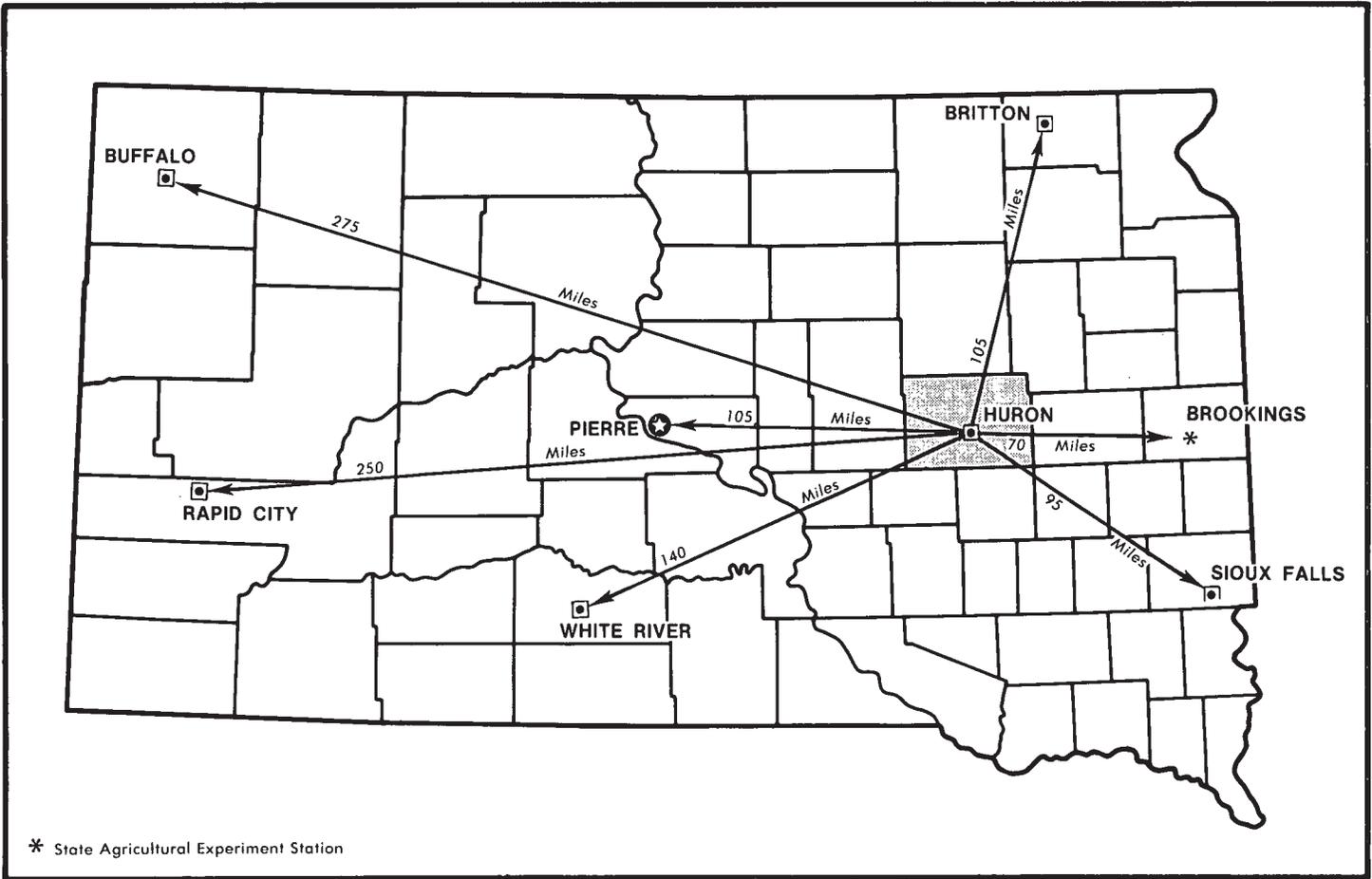
Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank absorption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

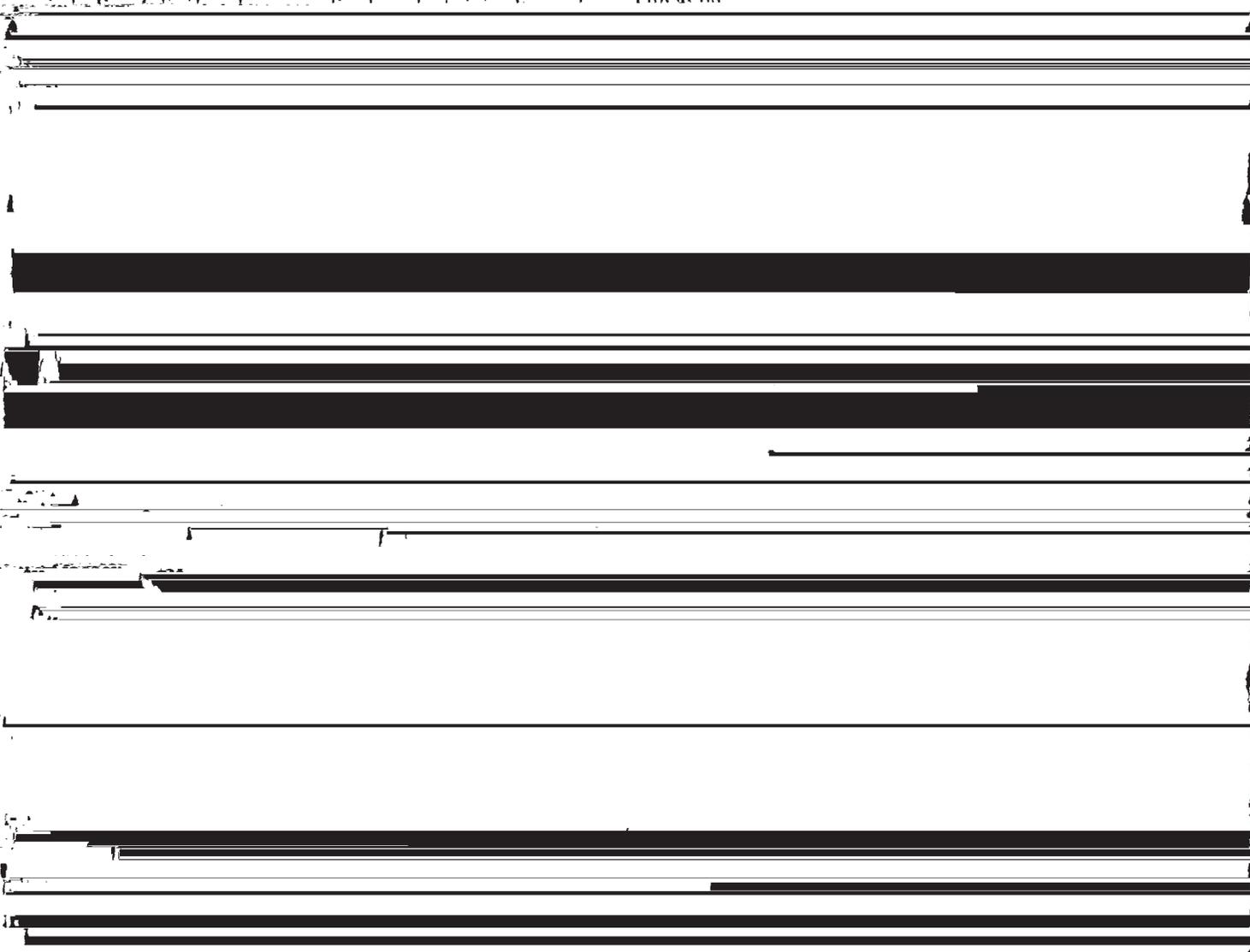
The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The percentage of possible sunshine is 75 in summer and 55 in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 14 miles per 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



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

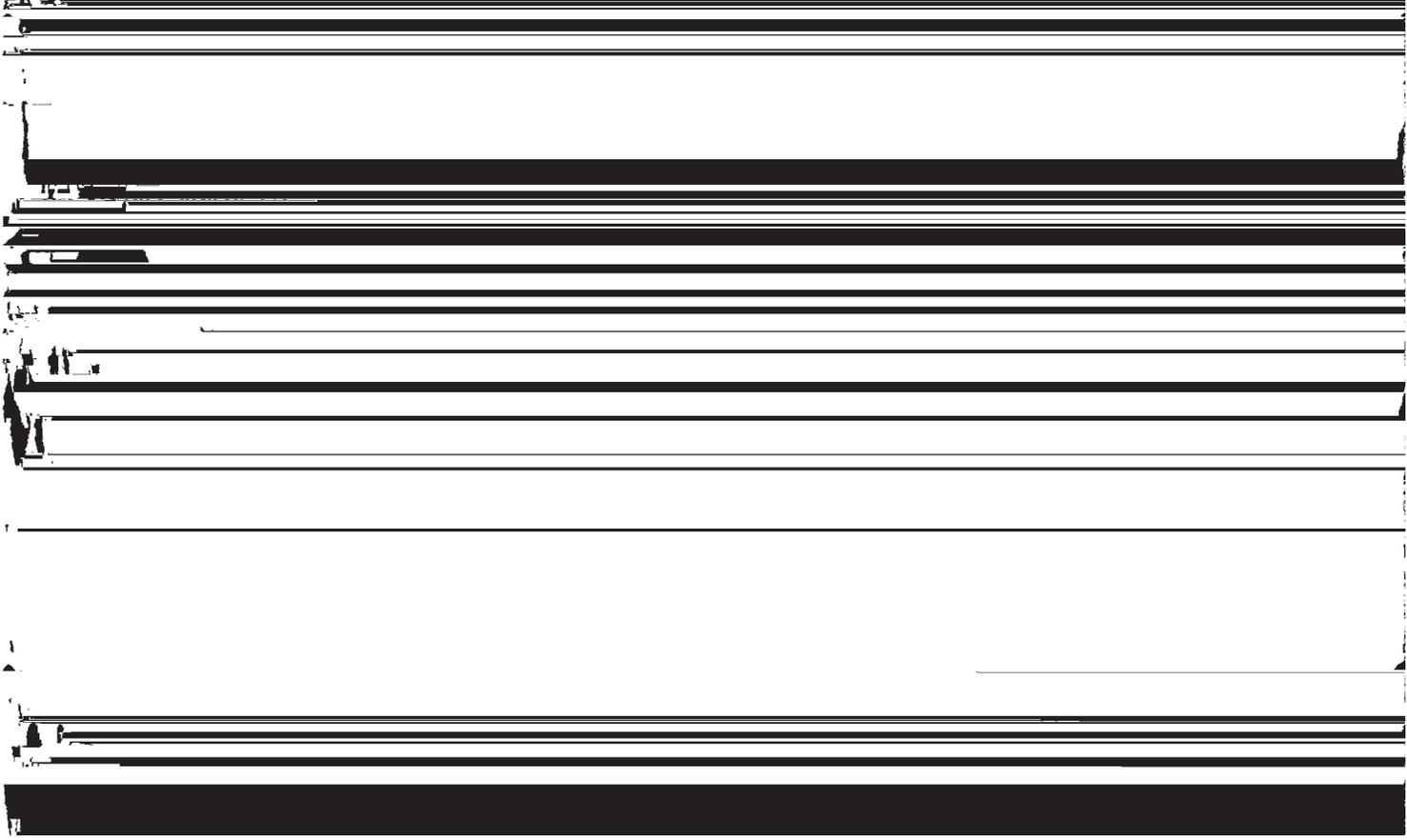
Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had

gineering 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



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.

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 shal-

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

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.

Betts soils.

Most of the acreage of this map unit remains in native grass and is used for range. Small areas of the less slop-

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 hay-

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

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 drainageways. 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

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 soil. Similar clayey soils, Houdek and Prosper soils

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

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 East soils in

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

The table consists of approximately 15 rows and several columns. The content is almost entirely obscured by thick black horizontal bars. Some faint text is visible in the left margin, possibly indicating row numbers or column headers, but they are illegible. The redaction covers the majority of the data cells.

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

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

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

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 hay-

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.

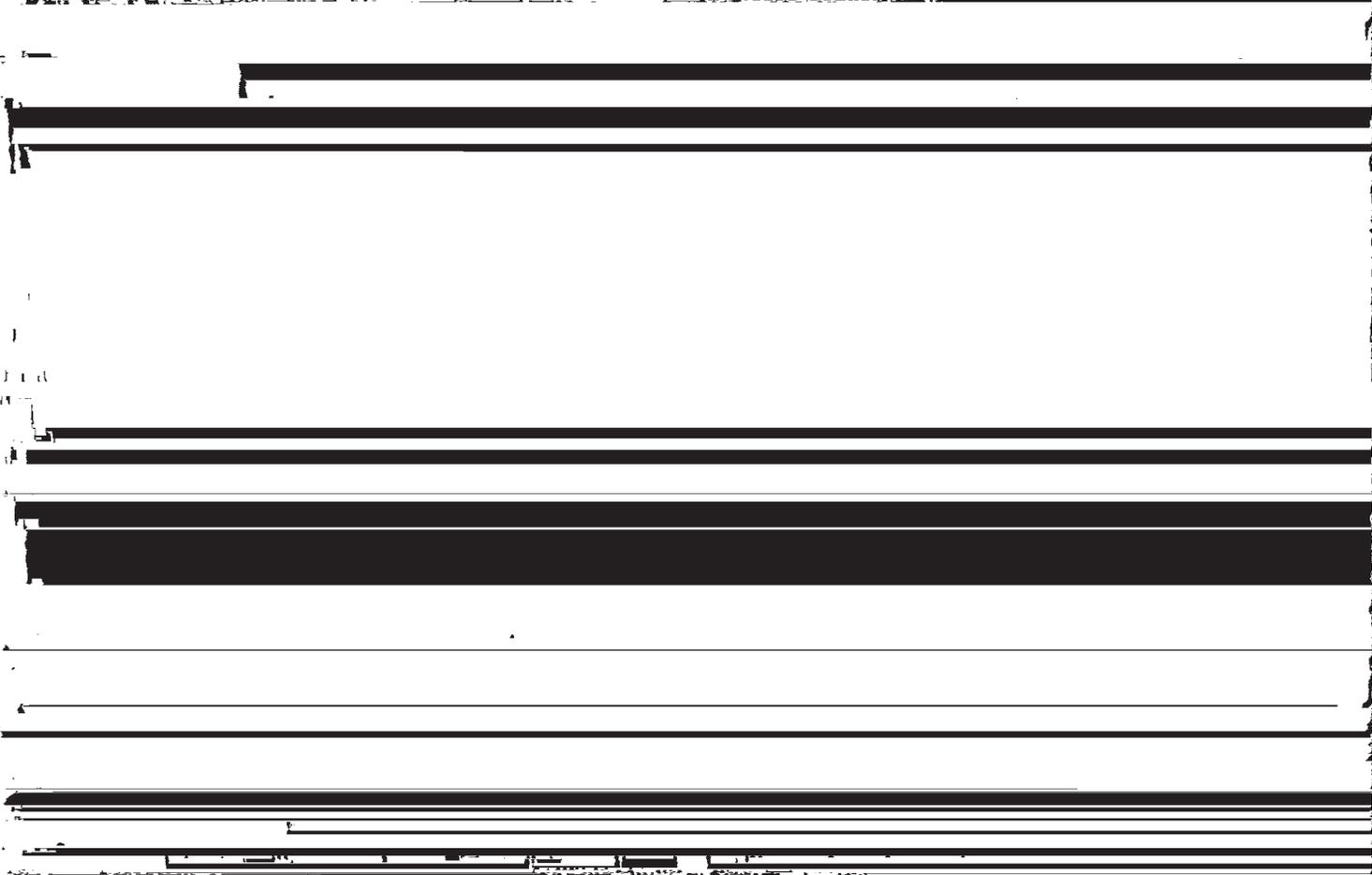
Most areas of this soil are farmed. The soil has good potential for crops, tame pasture and hayland, range, and openland and rangeland wildlife habitat. The potential for windbreaks and environmental plantings is fair, and the potential for most recreation uses is fair to good. The potential for most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

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 than 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



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 designed foundations and footings and drainage are off

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.



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

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

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.

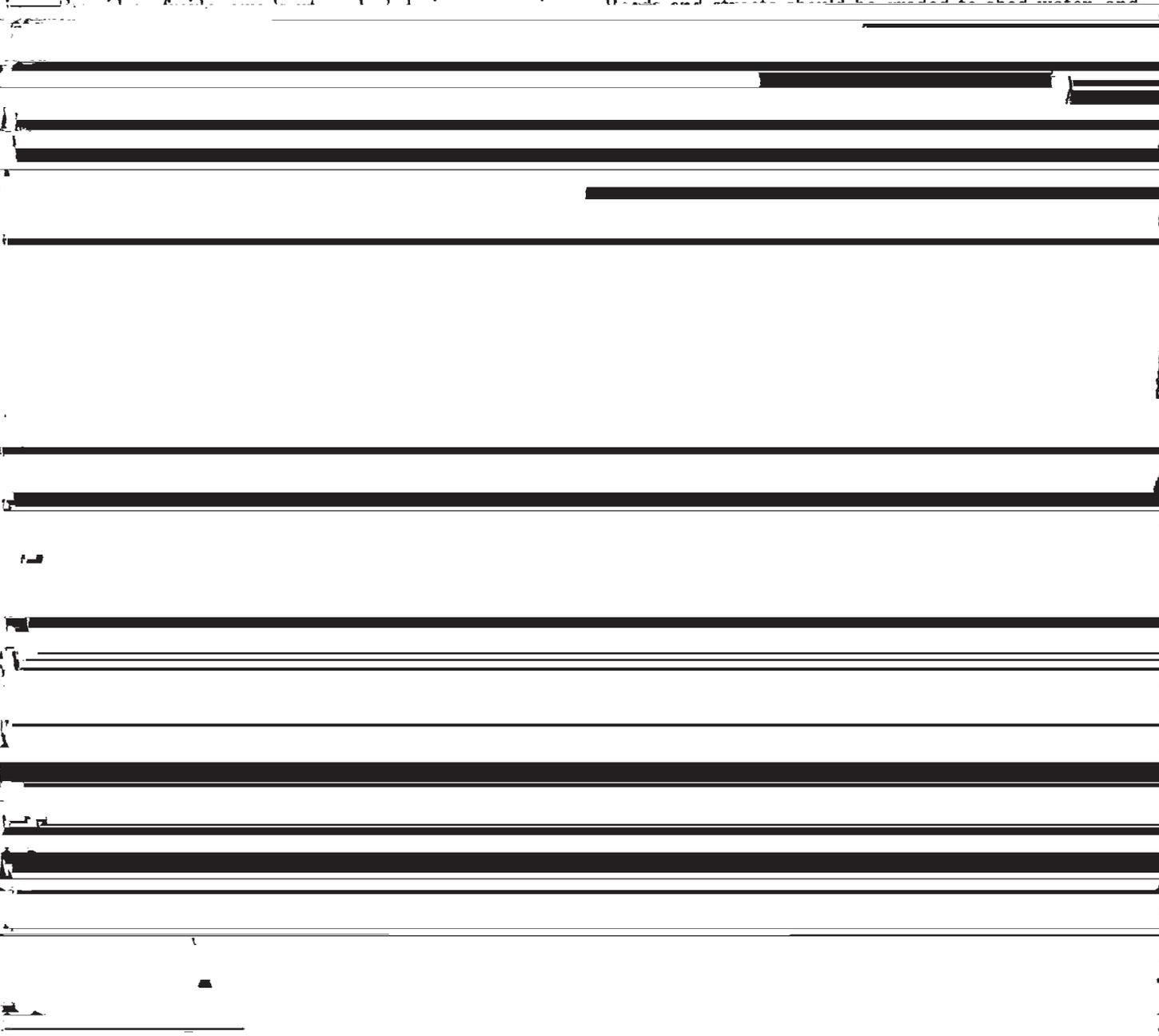
Typically, the Beadle soil has a surface layer of dark gray loam about 8 inches thick. The subsoil is about 23 inches thick. It is dark grayish brown, firm clay loam and clay in the upper part and grayish brown, calcareous clay in the lower part. The lower part has roots and stubble.

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

BeD—Betts stony loam, 6 to 40 percent slopes. This deep, excessively drained, gently rolling to steep, stony soil

less steep parts of the unit, but all-weather access roads generally are needed because the soil is sticky.



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

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

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 wind-

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



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

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

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 sub-surface layer is very dark gray, very friable fine sandy

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.

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 sub-surface 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 strip-cropping 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 tith 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 tith.

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

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 manage

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

ment 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 tith 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

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, cal-

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



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.

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 pollut-

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 cut-

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



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. In-

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

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.

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 desirable short grasses and sedges.



proved. 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 clayey subsoil limits the growth of

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

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

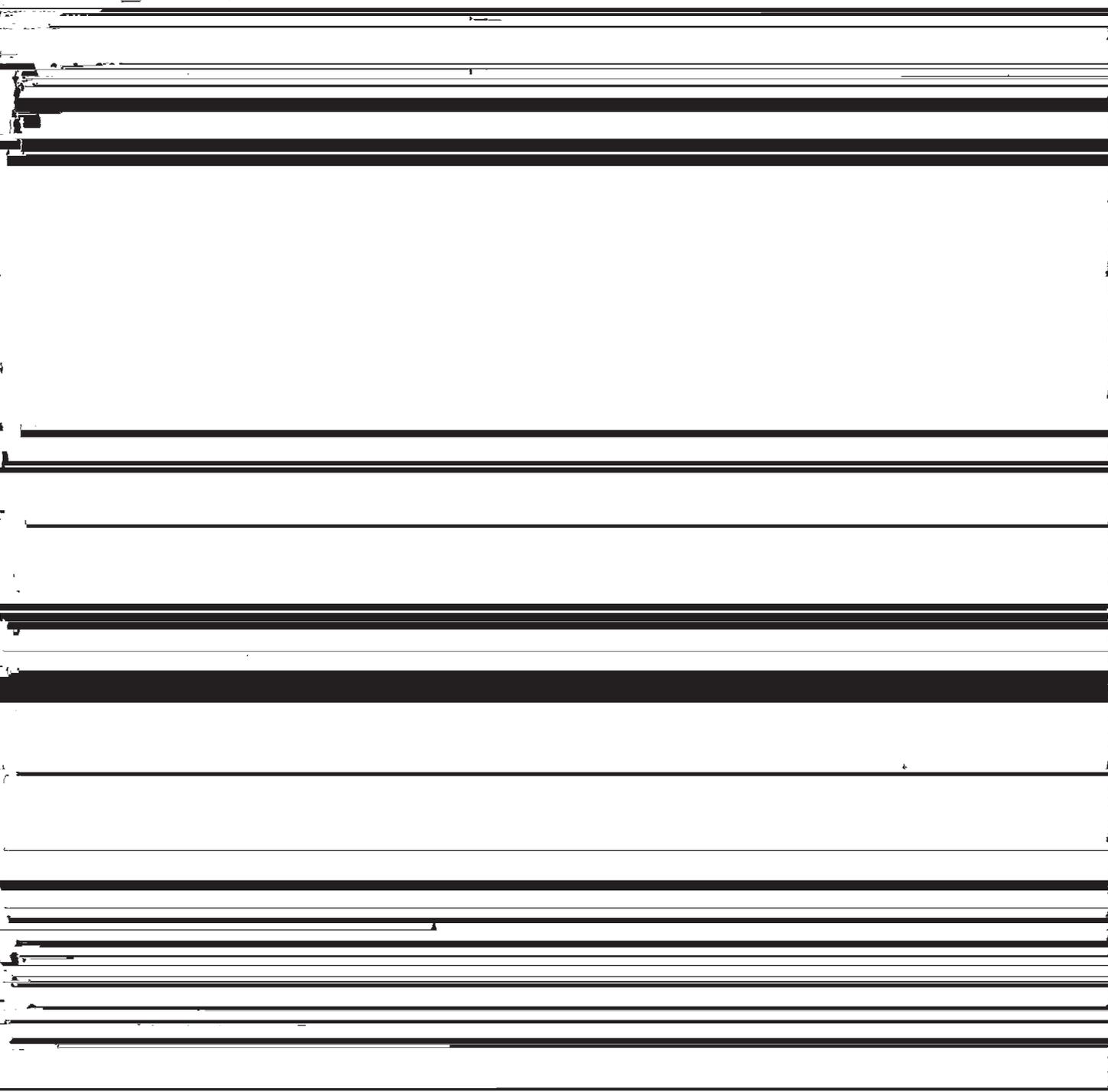
up 15 percent of some areas. The moderately well drained Carthage and Forestburg soils are on slight rises. They have contrasting loamy underlying material that is 20 to 40 inches below the surface. Also, the Carthage soils are less sandy than the Elsmere soil. The poorly drained Loup soils are on some 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



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

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



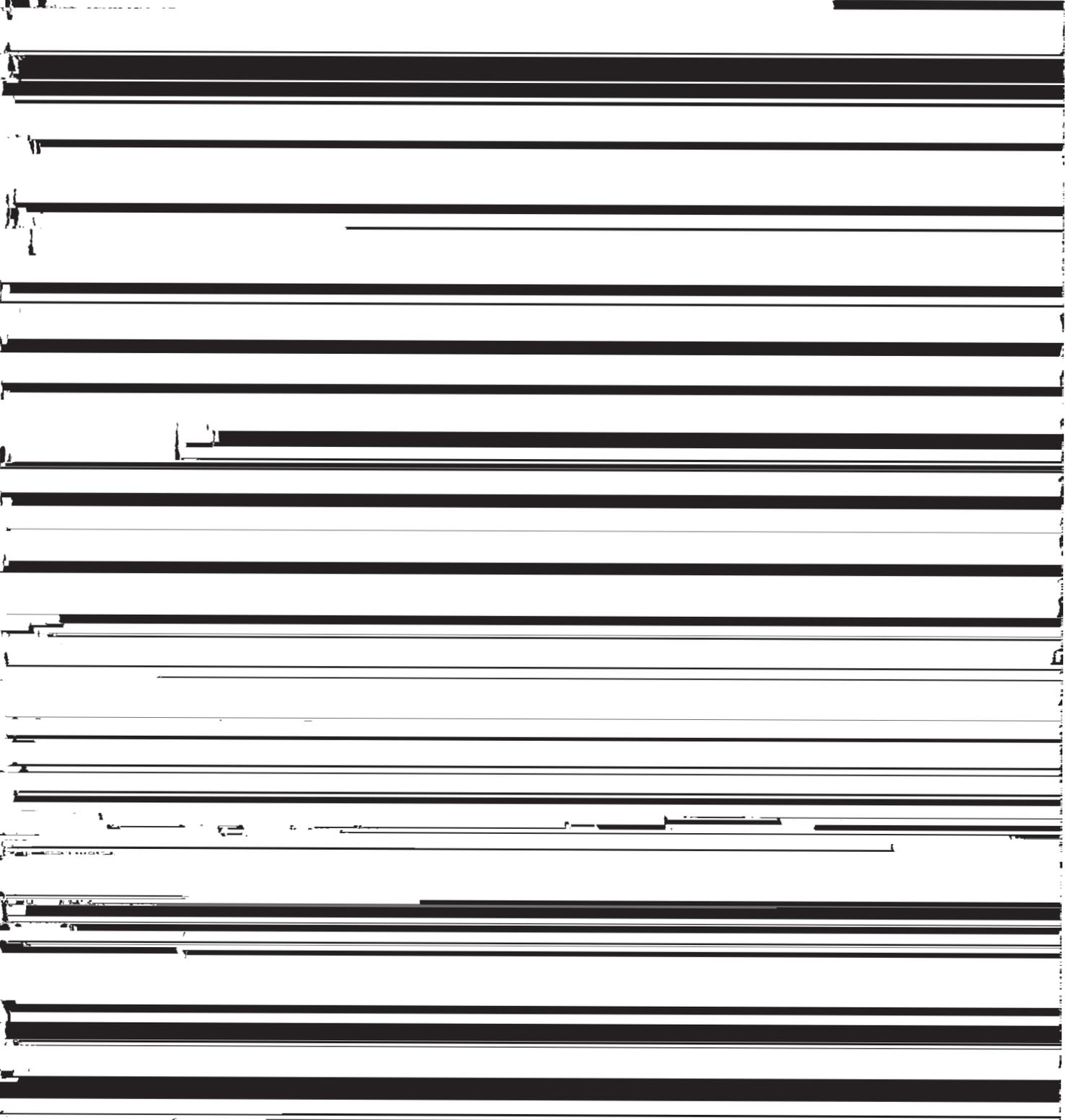
water. Other types of waste disposal are not suited because of the high water table.
Local roads and streets should be graded well above

deferred grazing maintains or improves the range condition. Proper location of watering sites promotes uniform grazing.

habitat and poor potential for windbreaks and environmental plantings.

depth of 29 inches is pale brown sandy loam. Below this is about 21 inches of light gray, calcareous loam over 10

This soil is moderately well suited to... Small...



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.

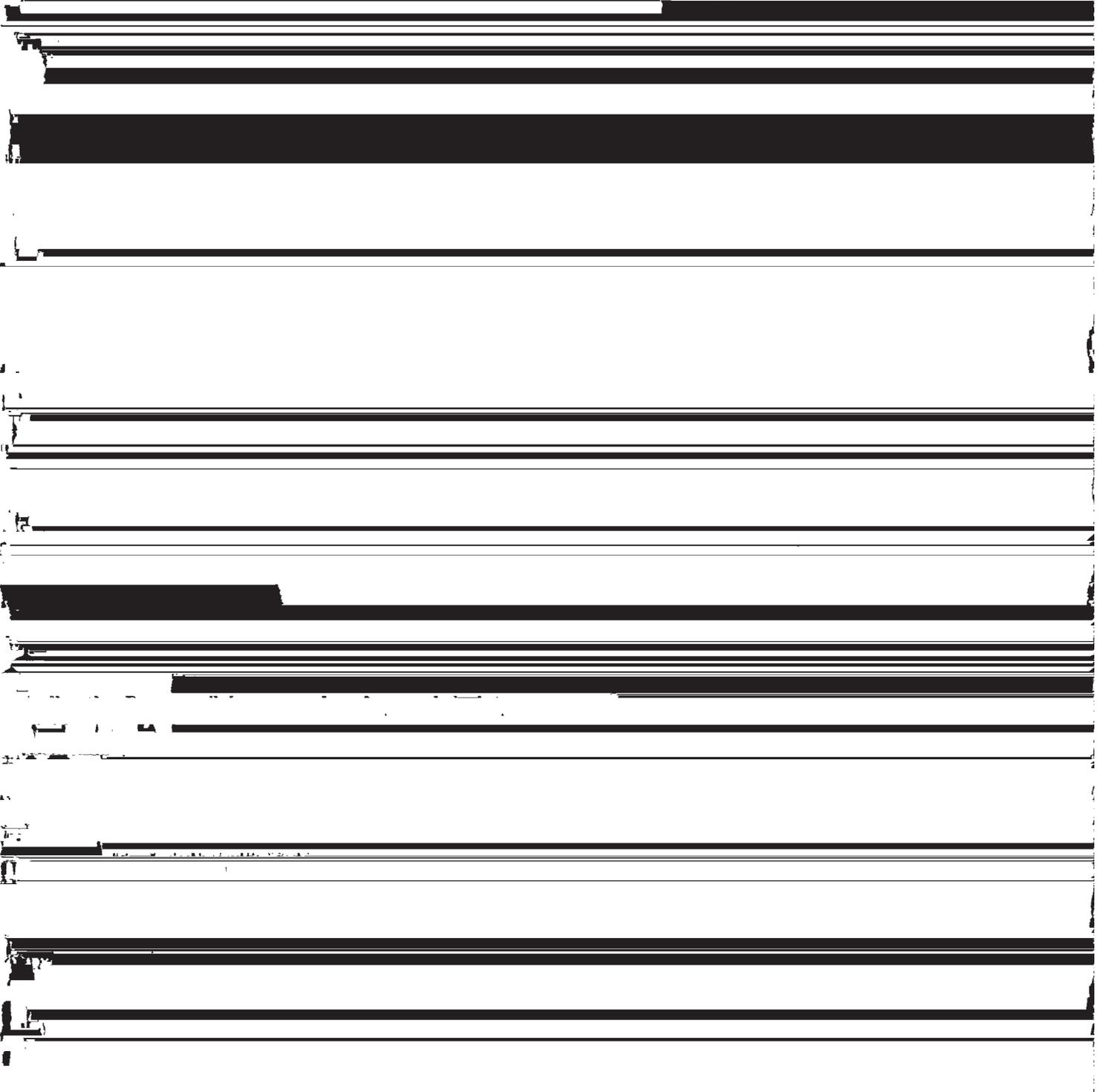
FrB—Forestburg-Doger loamy fine sands, 3 to 6 percent slopes. This map unit consists of deep, moderately well drained and well drained, undulating soils on uplands. Slopes are short. Most are convex, but some are concave. Individual areas are irregular in shape and range from 5 to 40 acres in size. They 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 sub-

surface 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

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. Main-



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

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.

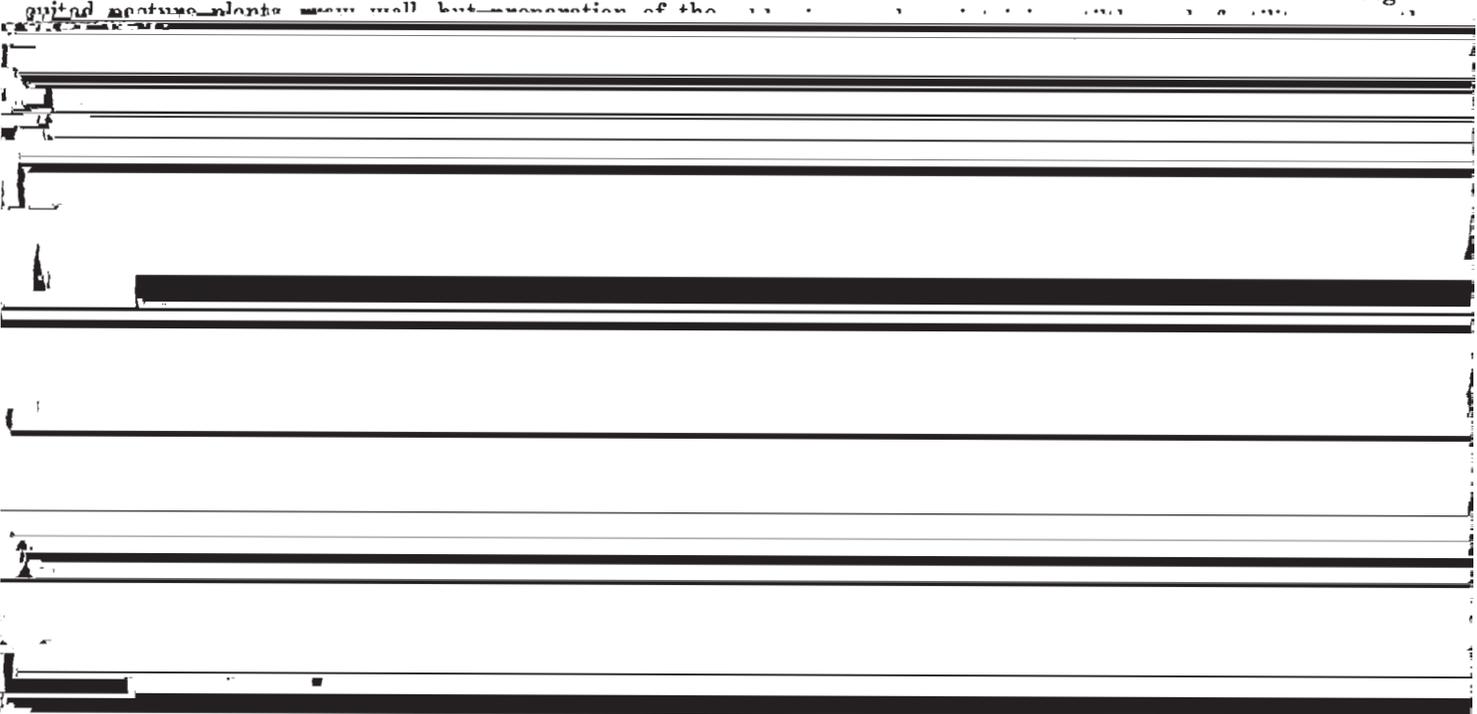
Typically, the surface layer is dark gray silt loam about 6 inches thick. The subsoil is about 14 inches of friable silt loam. It is dark grayish brown in the upper part and pale brown in the lower part. The underlying material to a depth of 52 inches is pale yellow, light gray, and white, calcareous 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



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

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

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.

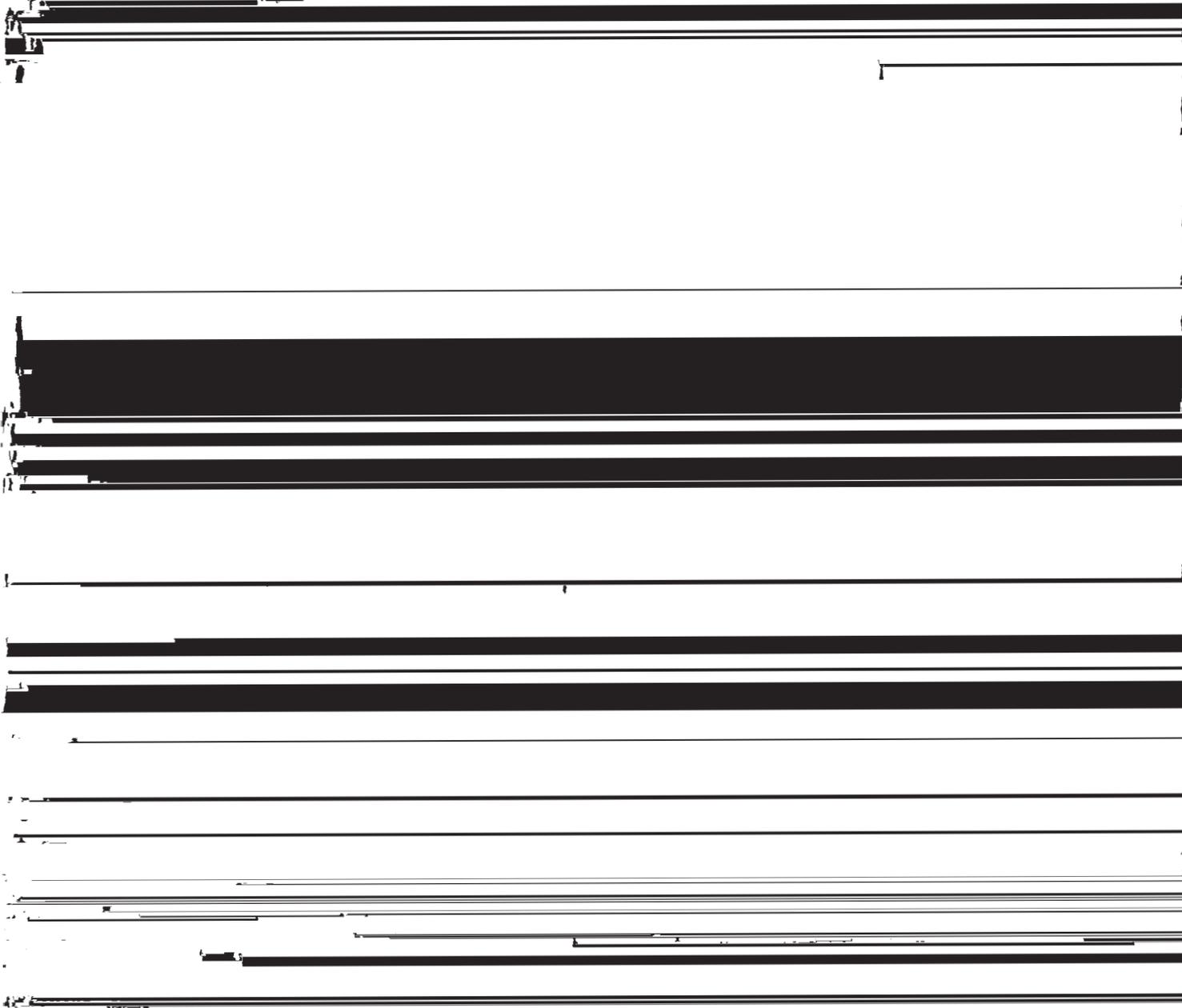
Typically, the Bonilla soil has a surface layer of dark gray and dark grayish brown loam about 9 inches thick. The subsoil is about 20 inches of friable loam. It is dark grayish brown and grayish brown in the upper part and light brownish gray in the lower part. The lower part is calcareous and has spots 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 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



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.

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

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 hay-
land because it is stony. Remove the stones from the

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.

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 is a silty clay loam with light brownish gray calcareous

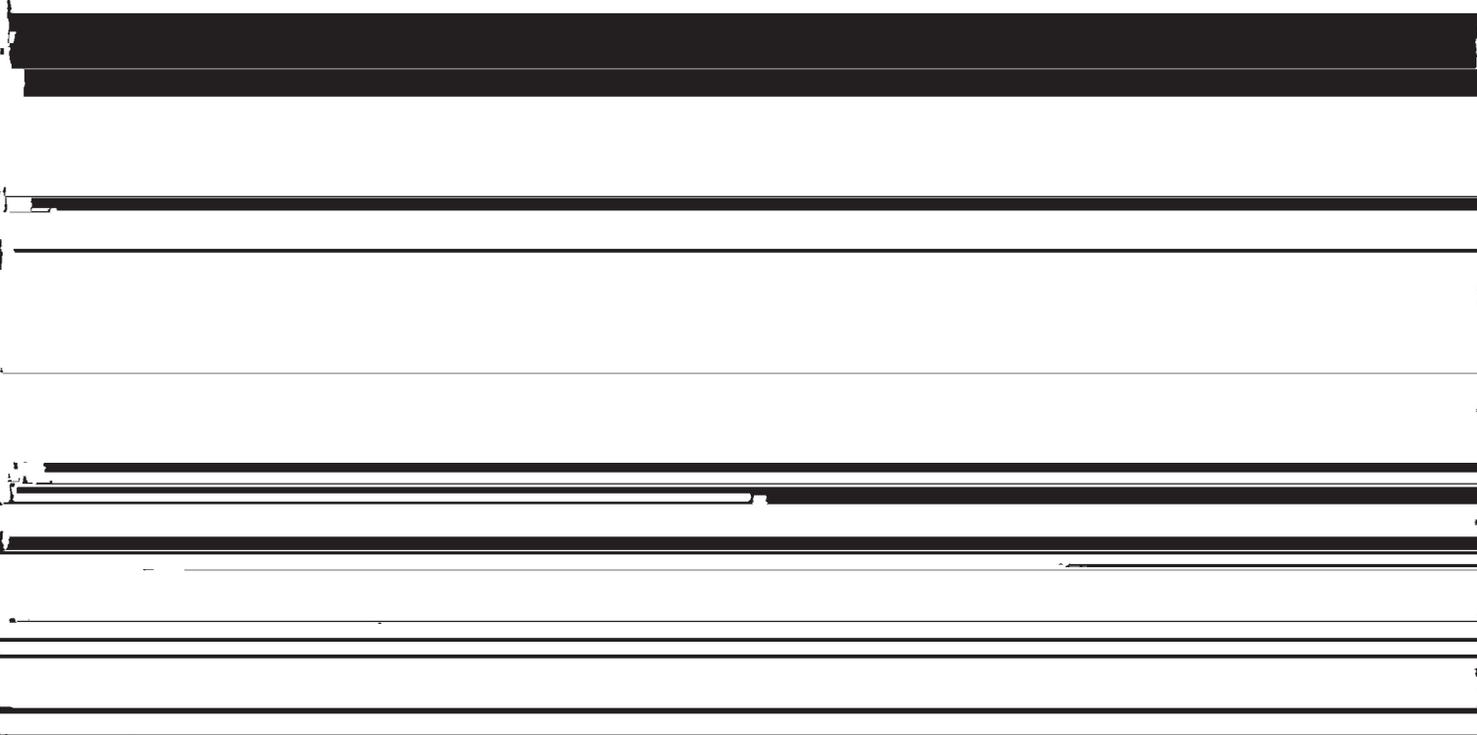
soils and moderately slow in the underlying material. The shrink-swell potential is moderate. Runoff is medium.

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



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 recrea-

tion 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 intermin-

gled 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

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.

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.

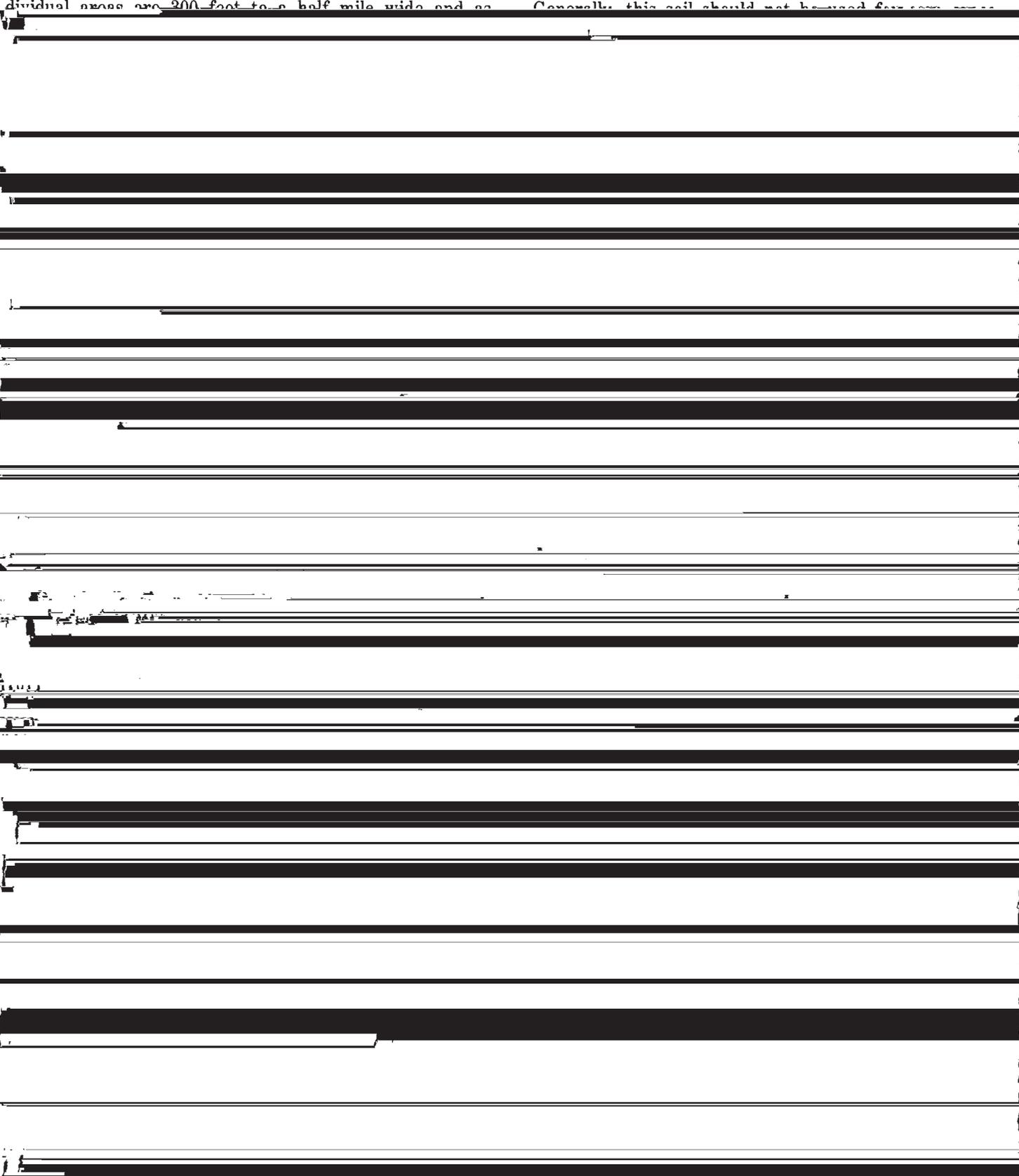
The poorly drained Egas soils contain more salts than the LaDelle soil. The Lamo soils are somewhat poorly drained.

This soil is high in fertility and in content of organic



Lm—Lamo silt loam. This deep, somewhat poorly drained, nearly level soil is on bottom land (fig. 11). Individual areas are 200 feet to a half mile wide and as

planting help to maintain the growth and vigor of the trees and shrubs. Generally, this soil should not be used for any other



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 strip-cropping 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

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 cereals. It commonly is



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 Moberg 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—Oklo 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 Oklo 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 Oklo 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.

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



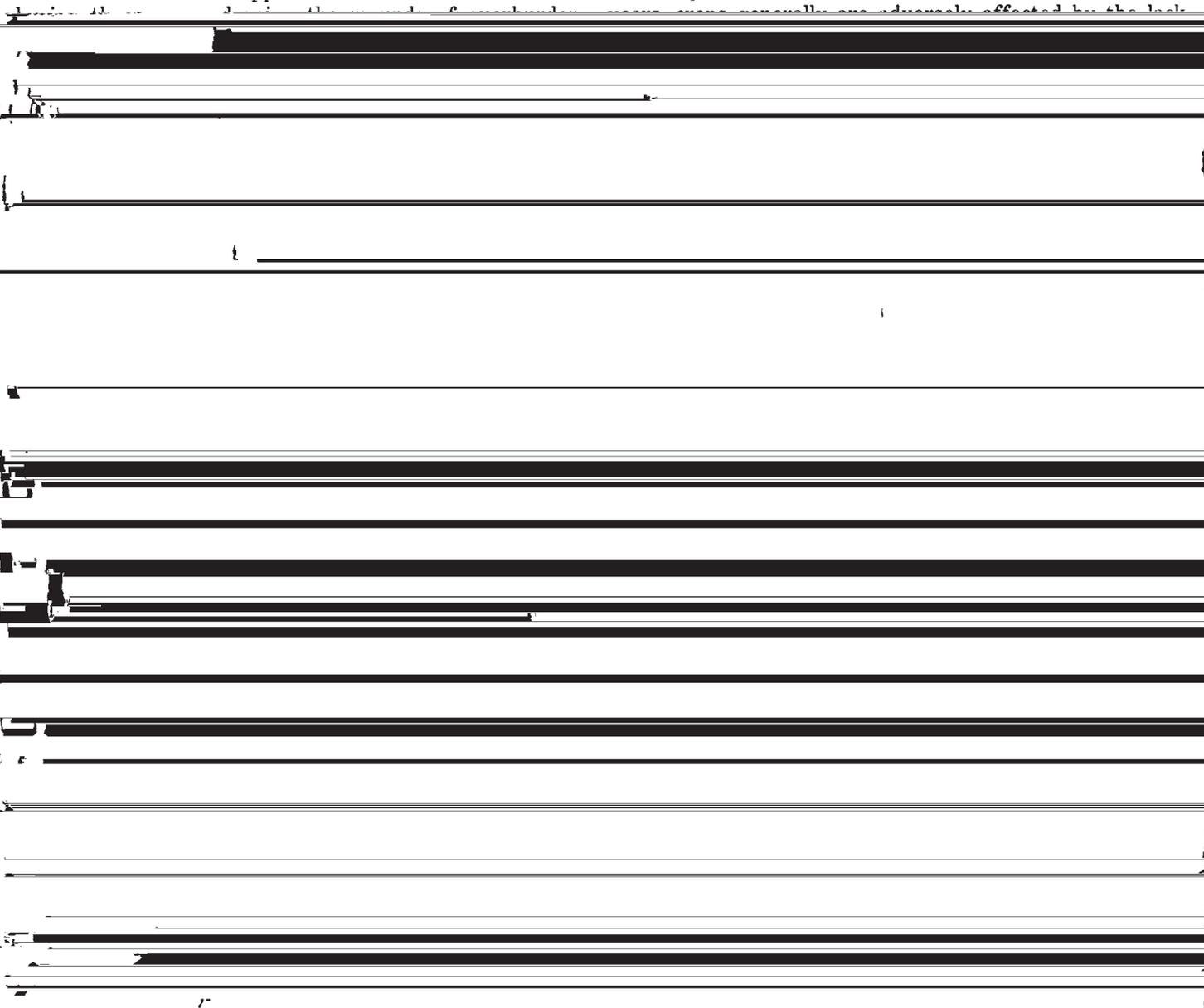
the sand and gravel has been completely removed. Mounds of overburden consisting of mixed loamy soil material are on the edges of the areas. The bottoms and sides of the pits support little or no vegetation. Annual weeds grow on the mounds of overburden material.

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

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



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

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

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.

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 environmen-



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

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

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.

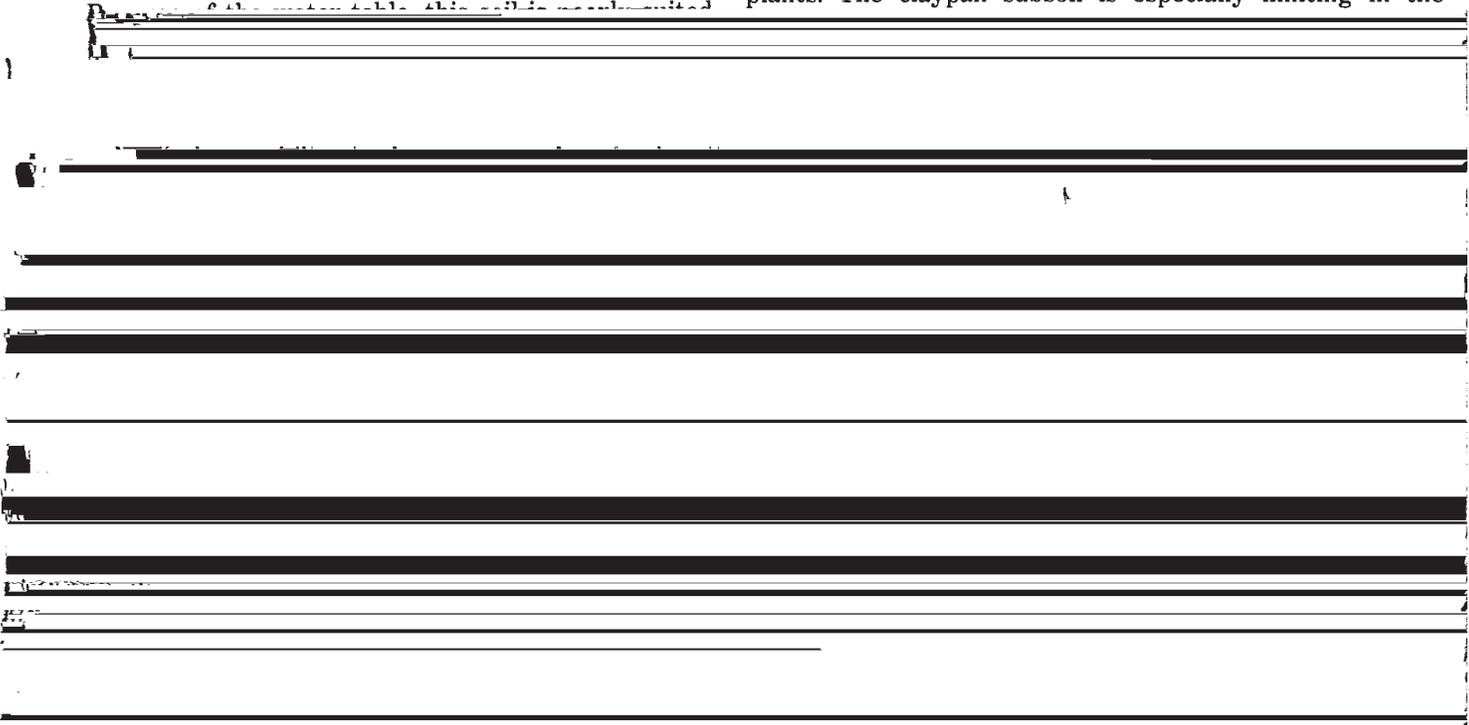
If buildings with basements are constructed on this soil, subsurface drains help to prevent damage caused by wet-

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



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.

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

~~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 felled or otherwise disturbed.

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 maintenance of range, the soil has good potential for~~

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.

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.

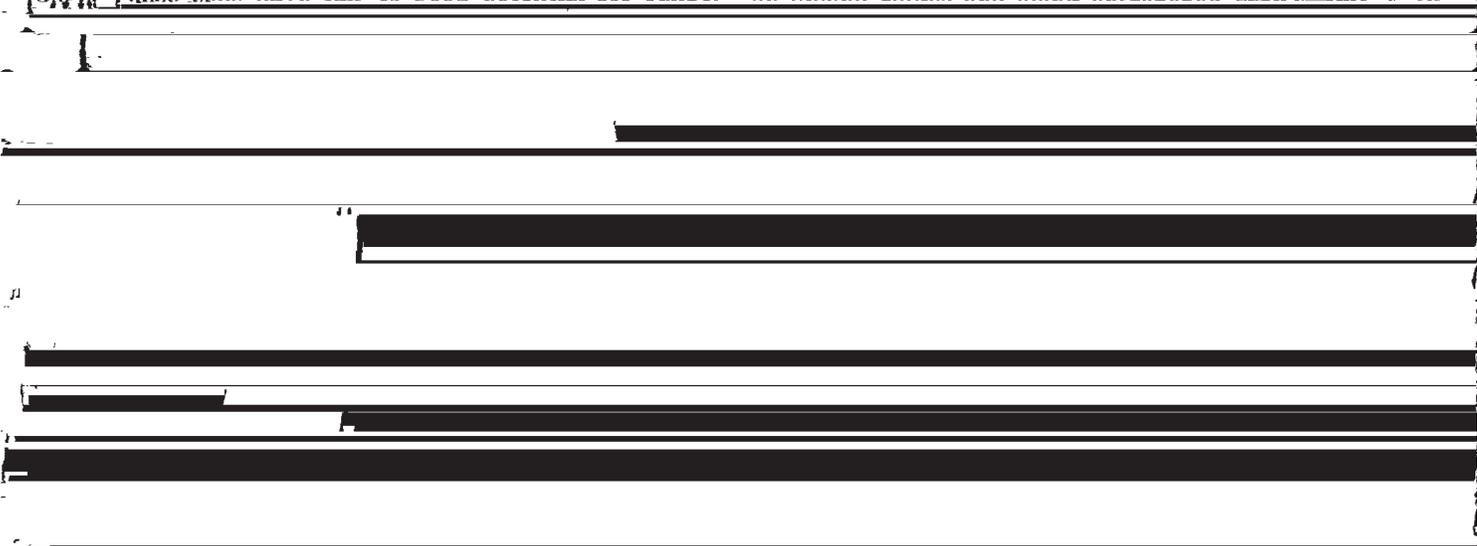
Because of wetness, these soils are not suited to windbreaks normally planted by machinery. Water-tolerant trees and shrubs can be grown if they are planted by hand and given special care.

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 drainage channels. It



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.

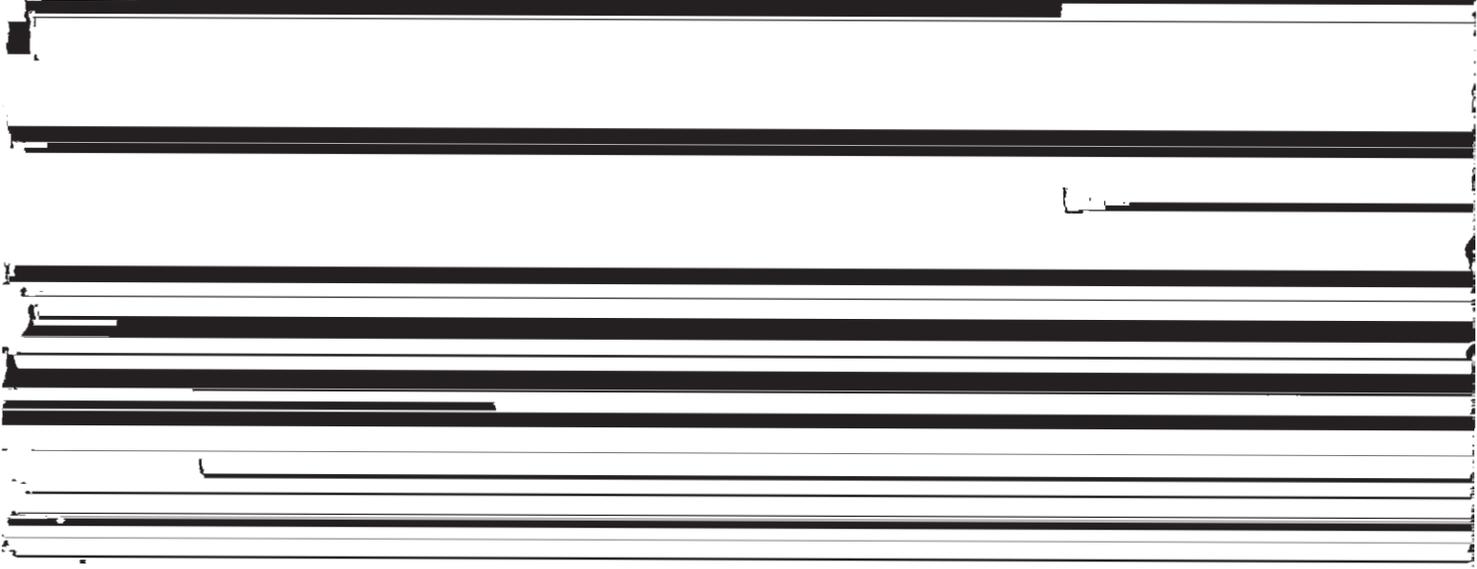
This soil is poorly suited to farming because the erosion hazard is severe. Where slopes are less than 9 percent, it is suitable for close-sown crops if erosion and soil blowing are controlled. Contour farming, terracing, grassed water-

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 manage-



ways, 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 selected if species that can tolerate a

ment. 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

The major management concerns in the use of the soils system that keeps a plant cover on the soil for extended

~~See page 54 for description of the soil system that keeps a plant cover on the soil for extended~~
[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

In addition, the species of vegetation plants best suited to the soil system that keeps a plant cover on the soil for extended

[Redacted]

Talmo soils. Grasses and legumes in the cropping system The soils are classed according to their limitations when
help to maintain fertility. On all soils addition of fertil the same need for field work, the risk of damage when

[REDACTED]

izer should be based on the results of soil tests, on the they are used, and the way they respond to treatment.

[REDACTED]

[REDACTED]

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.

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 widespread throughout the county. The average ranch is

Yields per acre

[Redacted table content]

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.

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 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 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

The yields were estimated assuming that the latest soil

[Redacted table content]

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

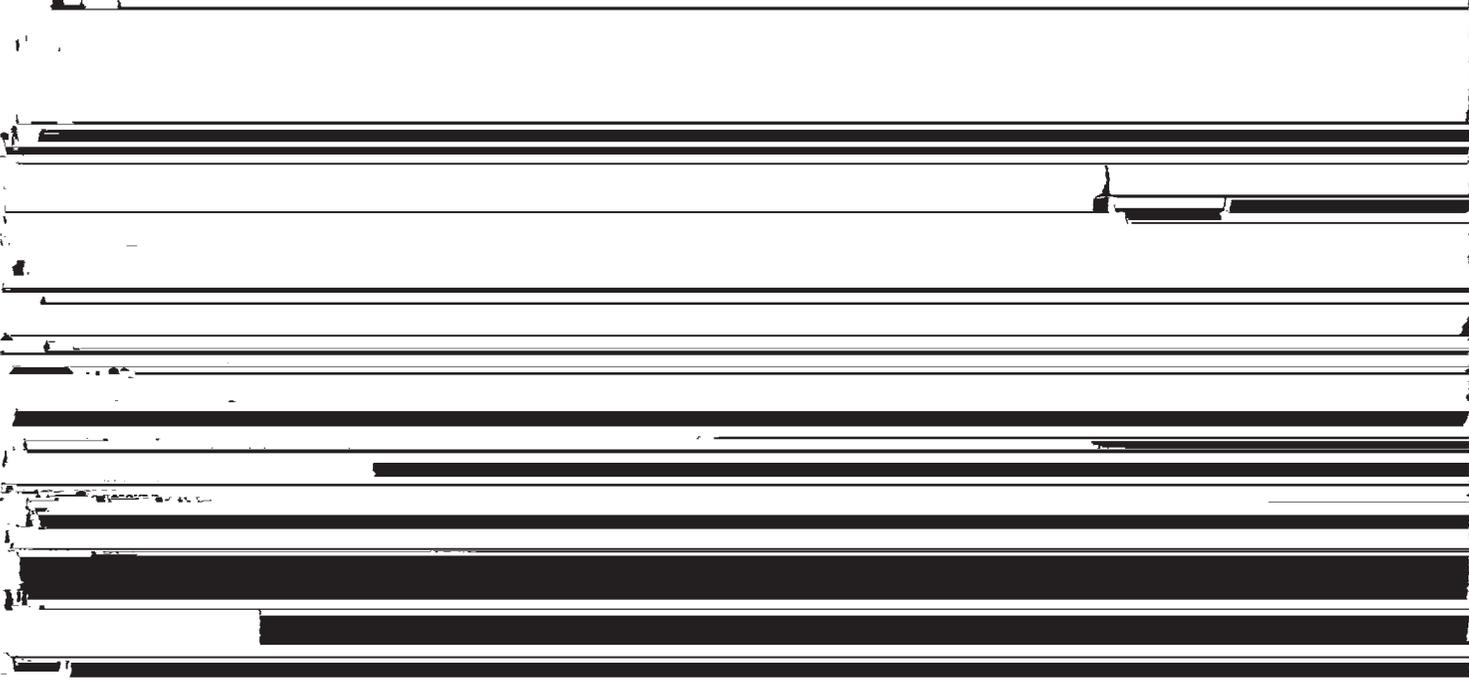
affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of hardwood trees are Russian-olive, American plum, common chokecherry, silver buffaloberry, and green ash.

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, and fox



tion 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 impor

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

tures 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.

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

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 ex-

cavated 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

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.

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

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.

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

cent 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.

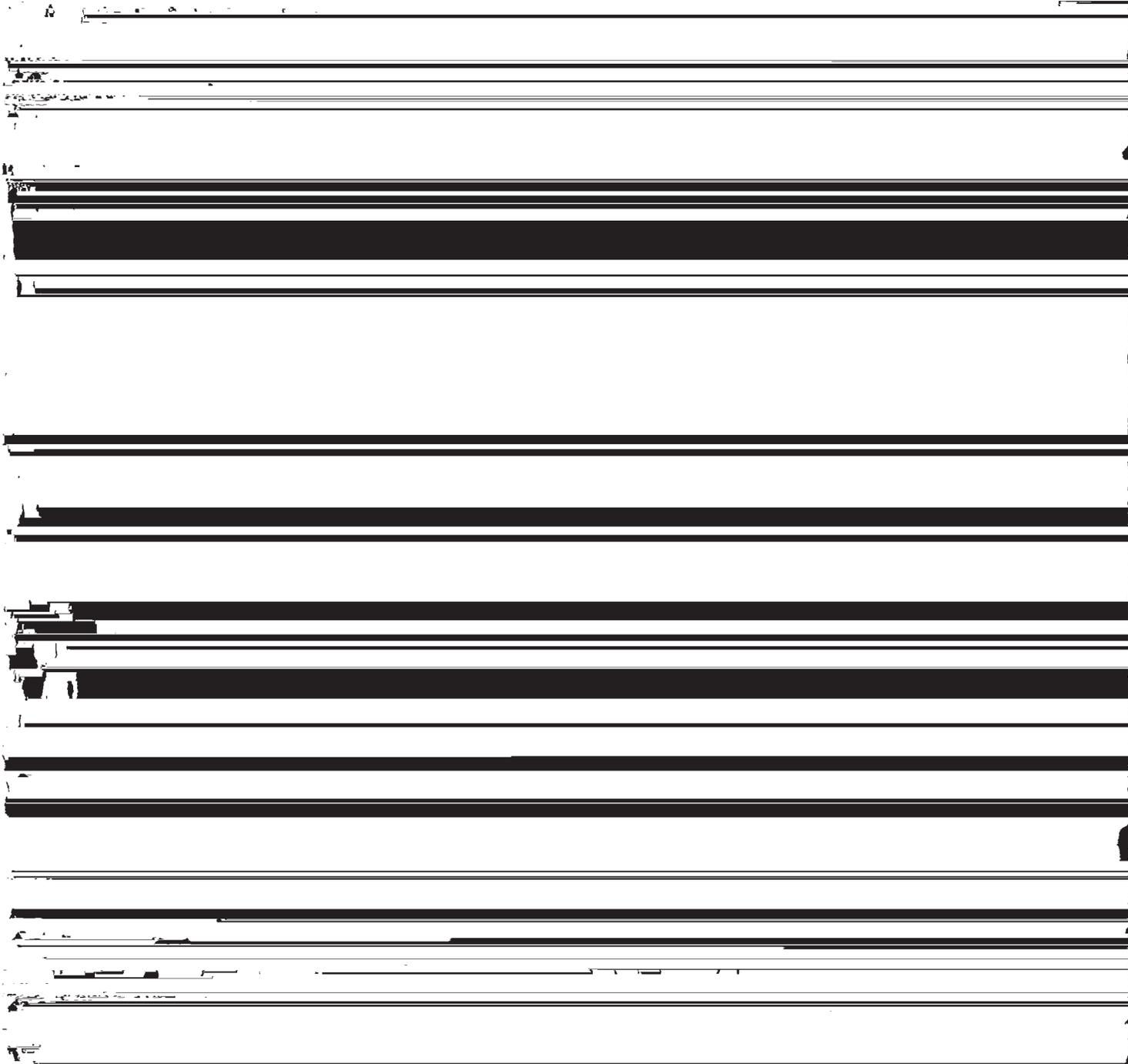
When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an addi-

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

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



4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium car-

al. These soils have a very slow rate of water transmis-

sion. Flooding is the temporary covering of soil with water



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,

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

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

- 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 com-

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

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 per cent.

Doger soils are near Blendon, Carthage, and Forest-

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



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.

C1c5a—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

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



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.

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 IIC 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.

part and moderately slow in the lower part. Slopes range from 0 to 6 percent.

All—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.



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.

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

ble, 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.

lowish 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.

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

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,

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.

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.

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.

Oko soils are near Beadle and Lane soils. Beadle soils

Typical order of Davison from top of Houdek

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,

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

(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 pedis; 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

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

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.

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.

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

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

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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- (9) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.
- (10) United States Department of Agriculture. 1975. Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys. U.S. Dep. Agric. Handb. 436, 754 pp., illus.

Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	<i>Inches</i>
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

- resources. S. Dak. Geol. Surv., Bull. 18, 63 pp., illus.
- (6) South Dakota Crop and Livestock Reporting Service. 1975. South

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between

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

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

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.

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

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

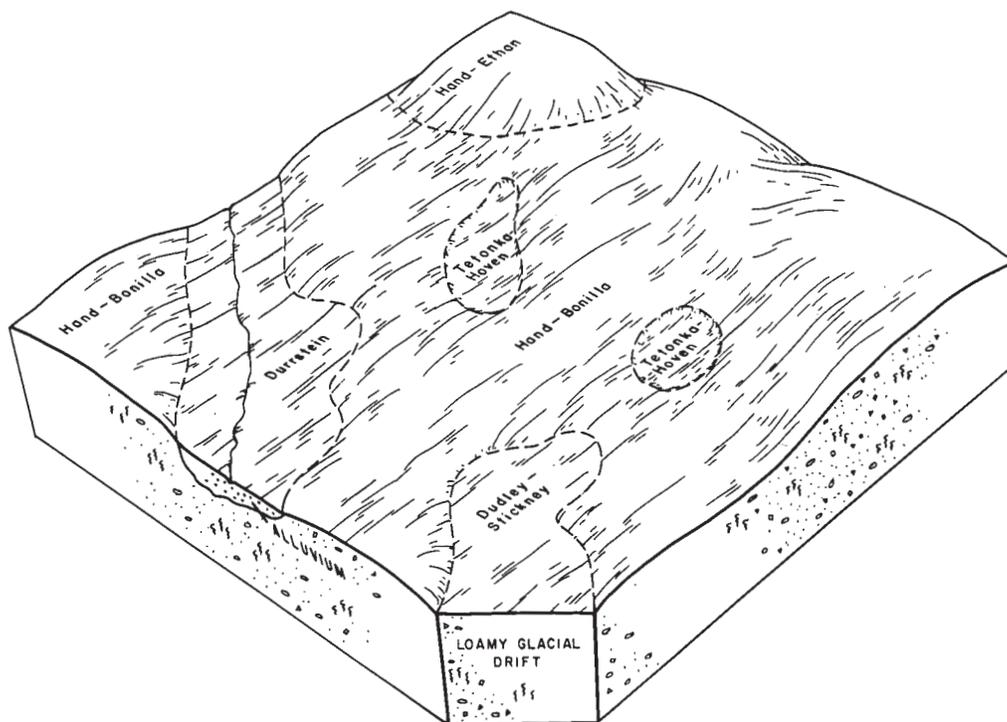


Figure 1.—Pattern of soils and underlying material in the Hand-Bonilla map unit.

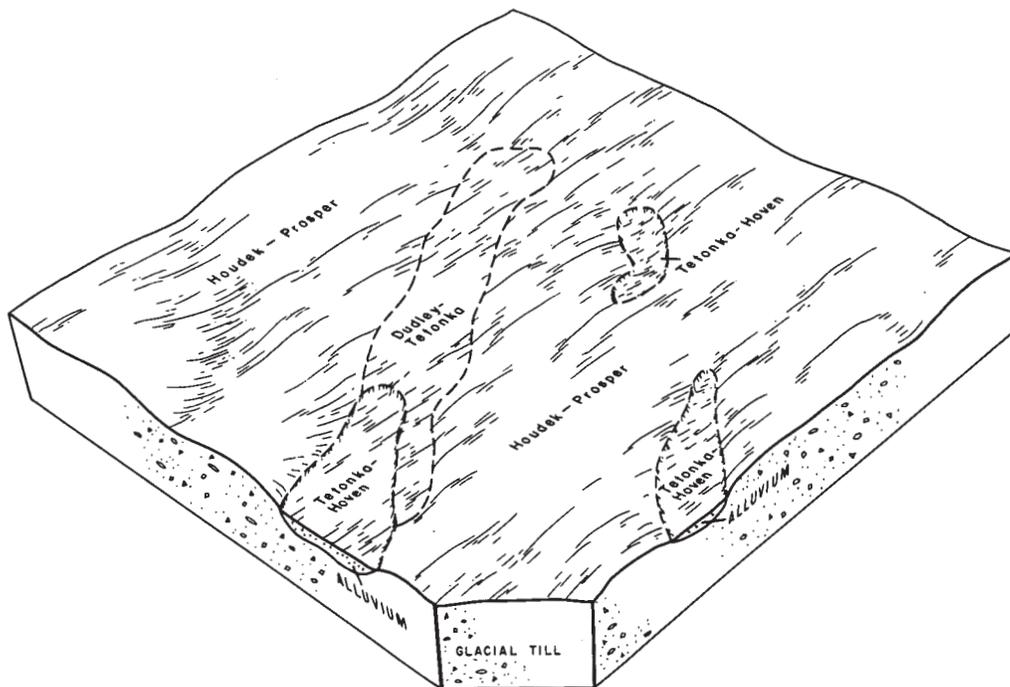


Figure 2.—Pattern of soils and underlying material in the Houdek-Prosper map unit.

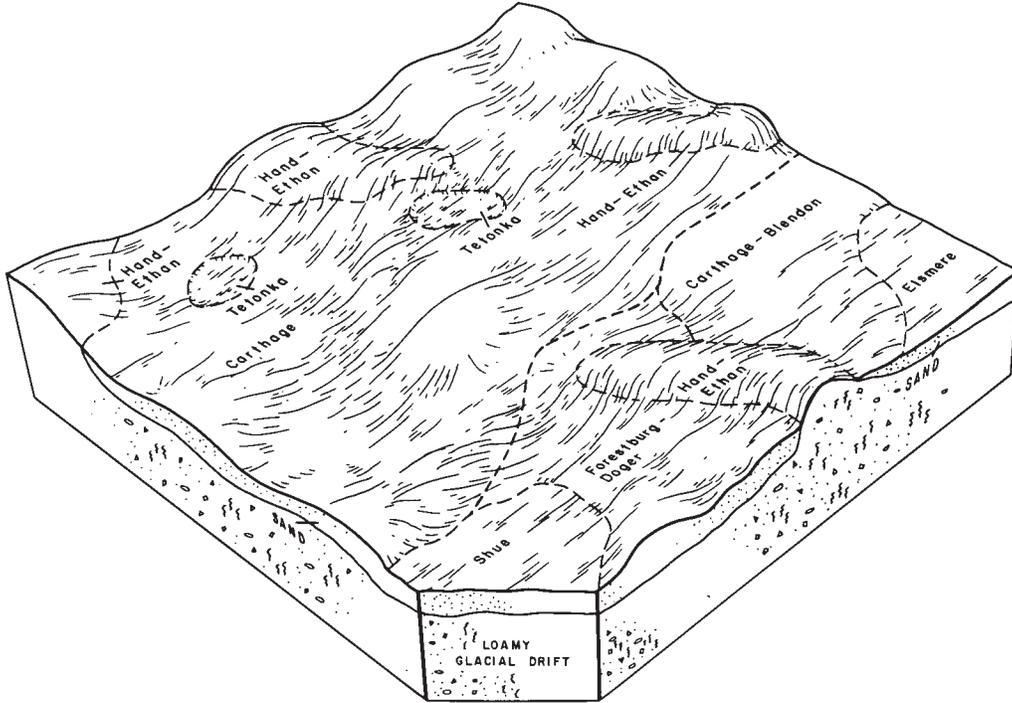


Figure 3.—Pattern of soils and underlying material in the Carthage-Hand map unit.

Figure 4.—Short, convex slopes in an area of Betts-Ethan loams, 9 to 21 percent slopes.

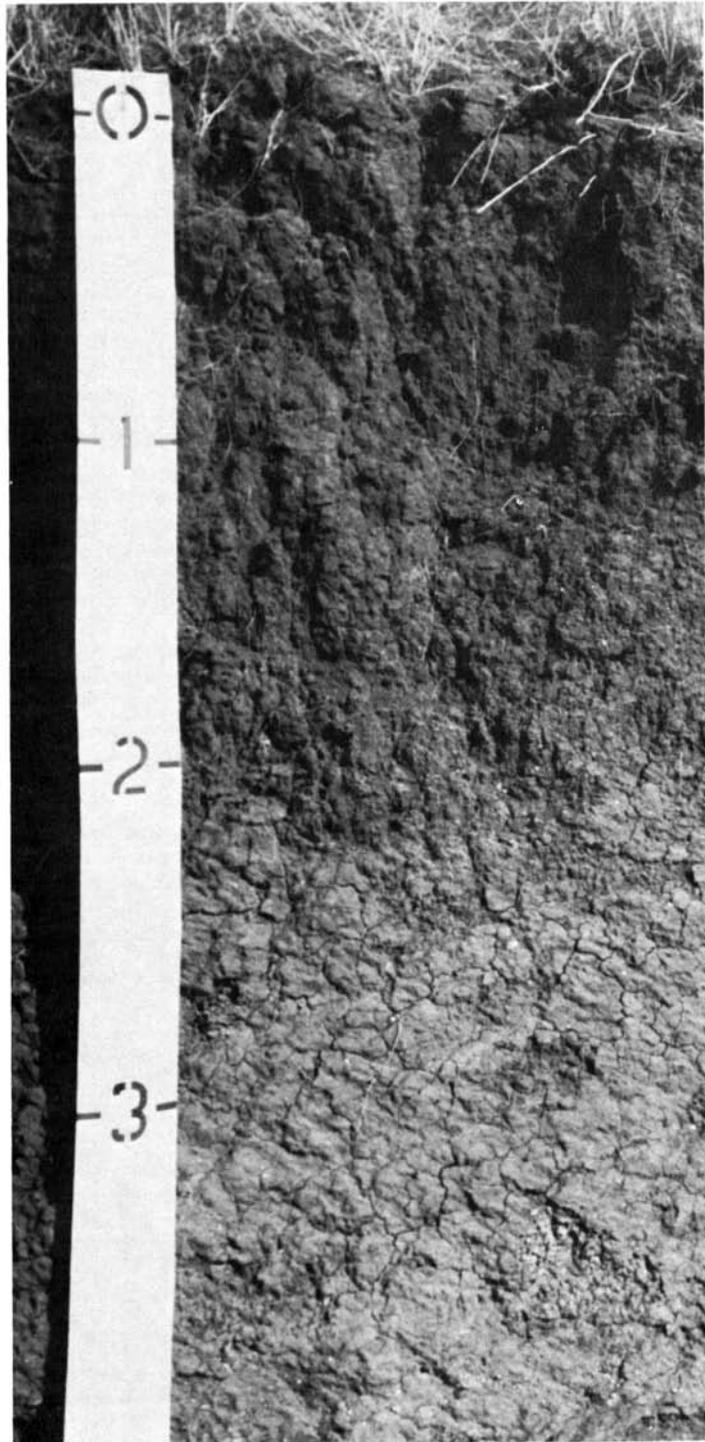


Figure 5.—Profile of Bon silt loam. Layers are indistinct.

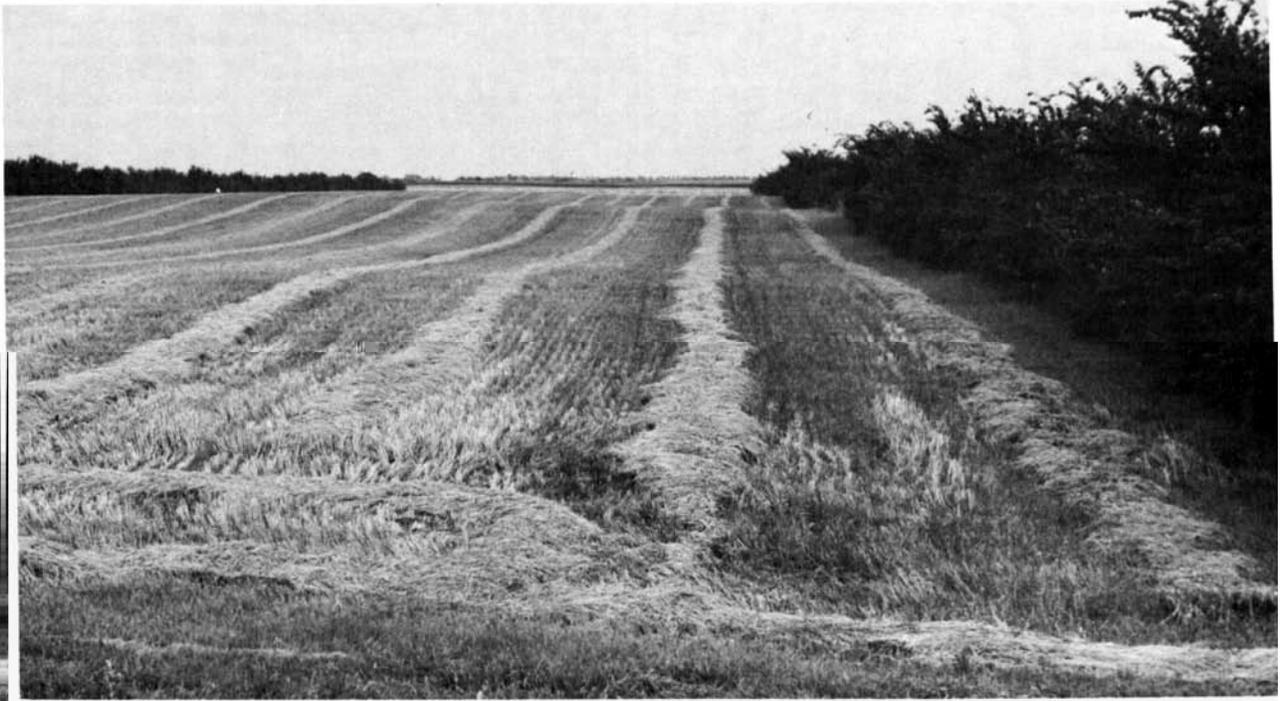


Figure 6.—Field windbreaks on Carthage-Blendon fine sandy loams, 2 to 6 percent slopes.

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.

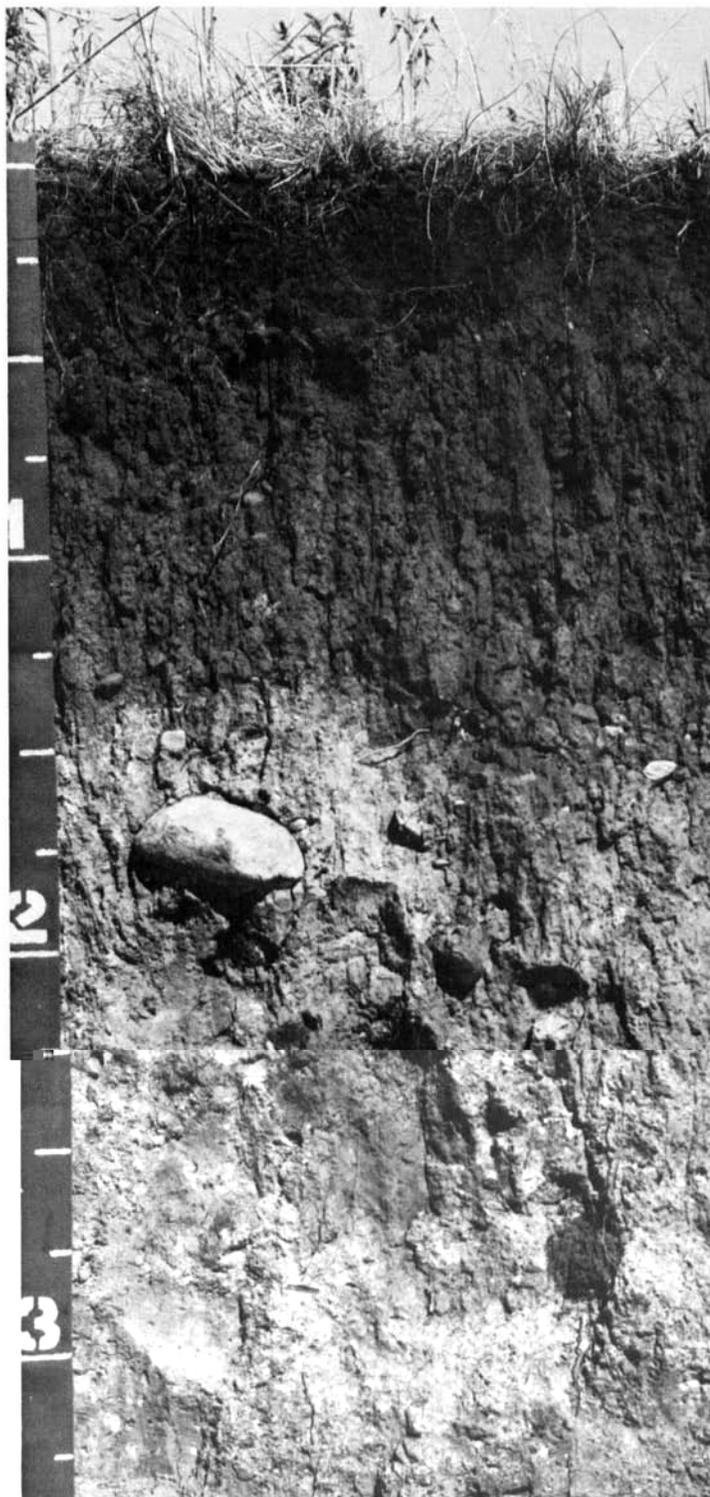


Figure 12.—Profile of Beadle loam, 0 to 2 percent slopes. The subsoil has prismatic structure.



Figure 13.—Profile of Delmont loam, 0 to 2 percent slopes. Gravelly sand is at a depth of about 16 inches.

Tables

SOIL SURVEY

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature ¹						Precipitation ¹				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have--		Average number of growing degree days ²	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
	°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

¹Recorded in the period 1951-74 at Huron, S. Dak.

²A 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

¹Recorded 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 Days	Higher than 28° F Days	Higher than 32° F 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

¹Recorded in the period 1951-74 at Huron, S. Dak.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[REDACTED]

Soil name and map symbol	Corn	Oats	Grain sorghum	Alfalfa hay	Bromegrass-alfalfa	Spring wheat
	Bu	Bu	Bu	Ton	AUM1	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

SOIL SURVEY

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
2FrA-----	47	41	40	2.3	3.7	---
2FrB-----	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
2GzB-----	48	56	45	2.1	3.5	24
Hand:						
2HaA-----	62	68	59	2.6	4.3	30
2HaB-----	57	65	55	2.5	4.2	28
2HbC-----	41	53	40	2.2	3.6	22
Houdek:						
HcB-----	---	---	---	---	---	---
2HdB-----	45	51	45	2.0	3.4	23
2HeB-----	53	59	49	2.4	4.0	26

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
	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>	<u>Ton</u>	<u>AUM¹</u>	<u>Bu</u>
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

¹Animal-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.

²This 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.

SOIL SURVEY

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		Characteristic vegetation	Composition
		Kind of year	Dry weight Lb/acre		
Beadle: BaA	Clayey	Favorable	3,480	Western wheatgrass	35
		Normal	2,900	Green needlegrass	30
		Unfavorable	2,030	Sideoats grama	10
				Little bluestem	5



TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

[The main body of the table is obscured by heavy black redaction bars.]

			weight		Pct
			Lb/acre		
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

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition		
		Kind of year	Dry weight Lb/acre				
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		
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		
Totanka part-----	Closed Depression-----	Favorable	6,160	Prairie cordgrass-----	50		

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight Lb/acre		
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

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight lb/acre		
Forestburg: 1FrB: 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	



TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight Lb/acre		
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		Characteristic vegetation	Composition
		Kind of year	Dry weight Lb/acre		
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		

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight Lb/acre		
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: 1PrA: 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		Characteristic vegetation	Composition
		Kind of year	Dry weight Lb/acre		
Prosper: 1PrA: 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: 1St: Stickney part-----	Clayey-----	Favorable	2,610	Western wheatgrass-----	85

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	Eastern redcedar, common chokecherry,	Green ash, hackberry, ponderosa pine,	---	---

| plum. |

| Russian-olive. |

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.	---	---	---
Jerault 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: DtA: Dudley part----	Eastern redcedar.	Siberian elm.	---	---	---
Tetonka part.	juniper, Siberian peashrub, silver buffaloberry, lilac.	green ash, Russian-olive.			
Durrstein: Du.					
Egas: Eg.					
Elsmere:					
	plum.	common chokecherry,	spruce, green ash, ponderosa	cottonwood, golden willow.	

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:					

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
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	Blue spruce, green	Golden willow,	Eastern

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.
Okto: OkB-----	Peking cotoneaster, lilac.	Siberian crabapple, common chokecherry, American plum, silver buffaloberry	Green ash, hackberry, ponderosa pine, Russian-olive, eastern redcedar.	---	---



SOIL SURVEY

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-----	---	---

¹This 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.--WILDLIER 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 herba-ceous 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.

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-----	Poor	Poor	Fair	Poor	Fair	Fair	Poor	Fair	Fair.
Loup									
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*. Pitt									
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.

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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-----	Slight-----
CaC-----	Slight-----	Slight-----	slope. Severe: slope.	Slight.
¹ CbA:				
Carthage part-----	Slight-----	Slight-----	Slight-----	Slight.
Blendon part-----	Slight-----	Slight-----	Slight-----	Slight.
¹ CbB:				
Carthage part-----	Slight-----	Slight-----	Moderate-----	Slight-----

SOIL SURVEY

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.
Delmont part-----	Slight	Slight	Moderate	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.
Jerould part-----	Severe: percs slowly.	Severe: too clayey.	Severe: percs slowly.	Severe: too clayey.
¹ DsA: Dudley part-----	Severe:	Moderate:	Severe:	Moderate:
slope, small stones.				

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Forestburg: 1FrA: Forestburg part-----	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
Doger part-----	Moderate:	Moderate:	Moderate:	Moderate:

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.
[REDACTED SECTION]				
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.

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.	Moderate: low strength.	Moderate: shrink-swell.	Moderate: low strength.	Moderate: frost action.

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: Do-----	Severe:	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.
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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: 1HaA:					
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.
1HaB: Hand part---	Slight-----	Moderate:	Moderate:	Moderate:	Moderate:
Bonilla part---	Moderate: wetness.	shrink-swell. Moderate: shrink-swell, low strength.	shrink-swell. Moderate: shrink-swell, wetness, low strength.	slope, shrink-swell. Moderate: slope, shrink-swell, low strength.	shrink-swell, low strength. Severe: low strength.
1HbC: Hand part---	Slight-----	Moderate:	Moderate:	Moderate:	Moderate:

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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:	Moderate:	Moderate:	Moderate:	Severe:

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: 1PrA: 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: 1St: Stickney part--	Moderate:	Severe:	Severe:	Severe:	Severe:

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-----	Slight-----	Severe:	Severe:	Severe:	Poor:

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.

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----- Mohr	Severe: floods.	Moderate: slope.	Severe: floods.	Severe: floods.	Fair: too clayey.

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.

SOIL SURVEY

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.
1DfB: 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:				



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: Gf-----	Poor: low strength, shrink-swell.	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: excess fines.	Unsuited: excess fines.	Good.
Bonilla part-----	Poor:	Unsuited:	Unsuited:	Good

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: 1PrA: Prosper part	Poor:	Unsuited:	Unsuited:	Poor:
Davison part-----	low strength. Fair: low strength.	excess fines. Unsuited: excess fines.	excess fines. Unsuited: excess fines.	thin layer. 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: 1St: Stickney part	Poor:	Unsuited:	Unsuited:	Poor:

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:						
RnA-----	Seepage-----	Seepage.	Not needed-----	Seepage-----	Not needed-----	Favorable.

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:						



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.
Moberg: M-----	Seepage-----	Low strength	Floods	Favorable	Not needed	Favorable
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: 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: S-----						

SOIL SURVEY

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	
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		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	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.

SOIL SURVEY

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches Pct	Percentage passing sieve number--				Liquid limit Pct	Plasticity index
			Unified	AASHTO		4	10	40	200		
Egas: Eg-----	0-3 3-60	Silty clay loam Silty clay, silty clay loam, clay loam.	CH, MH CH, MH	A-7 A-7	0 0	100 100	100 100	95-100 90-100	90-100 85-100	50-90 50-90	22-50 22-50
Elsmere: Em-----	0-24 24-44 44-60	Loamy fine sand Fine sand, loamy fine sand, loamy sand. Clay loam, loam, fine sandy loam.	SM, SM-SC SM, SM-SC CL, ML, SM	A-2 A-2 A-4, A-6, A-7	0 0 0	100 100 100	90-100 90-100 90-100	50-75 50-75 60-100	15-45 15-45 45-90	<25 <25 25-45	NP-5 NP-5 5-20
Enet: EnA, EnB-----	0-22 22-25 25-60	Loam----- Loam, fine sandy loam, sandy loam. Sand and gravel	ML, CL CL-ML, CL, SM-SC, SC SW, SW-SM, SM, SM-SC	A-4, A-6 A-4, A-6 A-1, A-2, A-3	0 0 0	90-100 90-100 60-85	85-100 85-95 45-70	70-95 60-95 10-60	55-80 45-75 0-15	30-40 20-40 <20	7-17 5-15 NP-5
Forestburg: FoA, FoB-----	0-6 6-29 29-50 50-60	Loamy fine sand Loamy sand, loamy fine sand. Loam, clay loam Stratified loamy sand to silt loam.	SM, SM-SC SM, SM-SC ML, CL SC, CL, SM-SC, CL-ML	A-2 A-2 A-4, A-6, A-7 A-4, A-6, A-2	0-5 0-5 0-5 0-5	95-100 95-100 95-100 95-100	90-100 90-100 95-100 90-100	70-100 70-100 80-95 60-90	15-35 15-35 60-90 25-90	<25 <25 30-45 20-40	NP-5 NP-5 8-20 5-15
¹ FrA: Forestburg part-----	0-6 6-29 29-50 50-60	Loamy fine sand Loamy sand, loamy fine sand. Loam, clay loam Stratified loamy sand to silt loam.	SM, SM-SC SM, SM-SC ML, CL SC, CL, SM-SC, CL-ML	A-2 A-2 A-4, A-6, A-7 A-4, A-6, A-2	0-5 0-5 0-5 0-5	95-100 95-100 95-100 95-100	90-100 90-100 95-100 90-100	70-100 70-100 80-95 60-90	15-35 15-35 60-90 25-90	<25 <25 30-45 20-40	NP-5 NP-5 8-20 5-15
Doger part-----	0-11	Loamy fine sand	SM,	A-2, A-3	0	100	100	95-100	5-35	<25	NP-5

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches Pct	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
Forestburg: Doger part-----	In										
	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 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

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		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	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		

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		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	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		
Tetanka 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.

SOIL SURVEY

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth In	Permeability In/hr	Available water capacity In/in	Soil reaction pH	Salinity Mmhos/cm	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	

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		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	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		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	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		

¹This 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.

SOIL SURVEY

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	
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	
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.
Hand part	B	Common	Very brief	Apr-Oct	0-6.0	Perched	Oct-Jun	Moderate.

SOIL SURVEY

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and	Hydro-	Flooding			High water table			Potential
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.

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	
					<u>Ft</u>			
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.

¹This 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.

SOIL SURVEY

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--							Maximum density	Optimum moisture
	AASHTO	Unified	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm	Pct	Lb/ ft ³		
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	95	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

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 Calcicquolls
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-siltv. mixed Cumulic Udic Haploborolls

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